Exhibit 2

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC

In The Matter Of	)	
Application Of	)	
	)	
EchoStar Communications Corporation,	)	**CS Docket No. 01-348**
General Motors Corporation, And Hughes	)	
Electronics Corporation	)	
	)	
For Consent For A Proposed Transfer	)	
Of Control	)	
	)	
To: The Commission	)	

DECLARATION OF WALTER L. MORGAN IN SUPPORT OF
PETITION TO DENY BY THE
NATIONAL RURAL TELECOMMUNICATIONS COOPERATIVE

I, Walter L. Morgan, hereby declare:

I am a Consulting Engineer with the Communications Center in Clarksburg, Maryland. My resume is attached hereto as Appendix G. I am making this Declaration on behalf of National Rural Telecommunications Cooperative ("NRTC") in connection with the consideration by the Federal Communications Commission ("FCC") of the application filed by EchoStar Communications Corporation ("EchoStar") and General Motors Corporation and Hughes Electronics Corporation (collectively, "Hughes") for transfer of control of certain FCC licenses (the "Application").

I. SUMMARY.

A. Issues Addressed.

This Declaration addresses the following issues:

- Assuming the proposed merger *is not* consummated and EchoStar and Hughes do not combine their Ku-band satellite capacity, how many Designated Market Areas ("DMAs") will DirecTV and EchoStar *each* be able to serve with local channels using existing satellites already ordered and planned for launch in 2002 or 2003?

- How many DMAs will both EchoStar and DirecTV will be able to serve assuming they each add only one additional satellite (beyond those already ordered) that uses spot-beam technology on only three frequencies?

- Assuming the merger is not consummated, can EchoStar and Hughes, standing alone, reach a critical mass of at least five million broadband customers with their existing inventory of full-CONUS Ka-band slots?

B. Conclusions.

Based on my analysis, as described below, I arrived at the following conclusions:

- **If the merger is not consummated, DirecTV will be able to provide local channels to approximately 110 DMAs and EchoStar will be able to provide local channels to approximately 80 DMAs using only satellites already in orbit or satellites currently on order.**

- **If DirecTV launches just one additional satellite beyond those on order, with spot-beam technology on only three frequencies, DirecTV will be able to serve a total of 187 DMAs, leaving only 23 unserved. These 23 could be served by using spot-beam technology with additional frequencies, or by rearranging the spot-beams or by some other means.**

- **If EchoStar launches just one additional satellite beyond those on order, with spot-beam technology on only three frequencies, EchoStar will be able to serve a total of 160 DMAs, leaving only 50 unserved. These 50 could be served by using spot-beam technology with additional frequencies, or by rearranging the spot-beams or by some other means.**

- **Hughes can provide Ka-band broadband service to approximately 7.6 to 14.5 million subscribers from its existing assigned orbital locations, well above the alleged critical mass of 5 million subscribers.**

- **EchoStar can provide Ka-band broadband service to approximately 6.6 to 12.7 million subscribers from its existing assigned orbital locations, well above the alleged critical mass of 5 million subscribers.**

II. DMAS THAT WILL BE SERVED BY EXISTING SATELLITES OR THOSE ON ORDER.

In this section, I determine how many DMAs DirecTV and EchoStar each will be able to serve assuming (1) the successful launch of DirecTV 7-S and EchoStar 7 and 8 (i.e., after both companies have two spot-beam satellites in orbit) using, (2) realistic technical parameters regarding the yet-to-be launched satellites; and (3) the merger is not completed.

A. Methodology.

For this portion of the study, I:

1) Used the FCC filing data for the EchoStar-7[1] and DirecTV-4S.[2]

2) Hypothesized how DirecTV-7S and EchoStar-8 might be configured based on FCC filings and other authoritative data from DirecTV and EchoStar.

3) Moved beams and changed frequency plans of DirecTV-7S and EchoStar-8 to try to serve additional DMAs within the constraints of items 1 and 2 above.

[1] Application of EchoStar Corporation for Minor Modification of DBS Authorization, Launch and Operating Authority for EchoStar 7, File Nos. DBS 88-01, DBS 88-02, August 10, 2001.

[2] Application for Authority to Launch and Operate DirecTV 4S (USABSS-13), May 18, 2001.

4) Assumed no merger and no use of simulcrypt[3] to allow both systems to serve a DMA even if only one system has satellite coverage of that market.

5) Assumed DirecTV-7S and EchoStar-7 and 8 would be successfully launched, but no additional spot-beam satellites would be deployed.

6) Gave preference to the largest 100 DMAs. Lower population DMAs are served only if there is excess capacity remaining.

7) Limited DirecTV-7S to six spot beam frequencies (like DirecTV-4S) and limited EchoStar-8 to five (like EchoStar-7).

8) Assumed no change to the current set top boxes.

9) Kept spot-beam sizes smaller to those disclosed in DirecTV's and EchoStar's public filings.

10) Assumed a video compression rate of 12:1.[4]

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[3] Simulcrypt is a conditional access method-allowing use of the same transmission by more than one service provider. Simulcrypt technology is readily available and could be used to allow DirecTV and EchoStar to share existing DBS frequencies. This is acknowledged in EchoStar and DirecTV's Joint Engineering Statement in Support of Transfer of Control Application at 3.

[4] The Joint Engineering Statement acknowledges the 12:1 ratio as a goal for the future. Joint Engineering Statement at 13. However, although they did not disclose this to the FCC, DirecTV has already achieved this goal.

The DirecTV web site page for each of the presently served cities lists the STV call letters and DirecTV channel numbers. A proper zip code gains entry to this page. For example, zip code 33602 opens the Tampa FL page. The list of Tampa stations and the corresponding DirecTV channel numbers are: WEDU (DirecTV channel 884), WFLA (885), WTSP (886), WTVT (887), WUSF (888), WCLF (889), WFTS (890), WMOR (891), WTTA (892), WTOG (893), WFTT (894) and WVEA (895). There are twelve STVs in this list. These DirecTV channel numbers are reused in other cities, for example in Phoenix, but only if served by frequency 20 (which is 12501.02 MHz per ITU AP30 (Orb-85)-116). The DirecTV channel numbers and the spot beam combinations are provided in the Application for Authority to Launch and Operate DirecTV-4S dated May 2001. When combined, these two official DirecTV sources show that Tampa (and several other cities) fill all 12 STV channels from one transponder. Furthermore, DirecTV broadcasts a table of channel assignments on a transponder frequency-by-transponder frequency basis 24 hours a day. Several CONUS transponders have twelve STV channels. These may be accompanied by some of the audio-only channels. This shows that at the present time, a compression ratio of 12:1 is in commercial use serving millions of paying subscribers. By the end of 2003, when each company plans to have two spot-beam satellites in orbit, the companies should both be at a compression ratio of at least 12:1, and there is a good chance that they will have achieved a higher ratio—at least if the merger is not completed, and they continue to compete with each other on technical, as well as other, matters.

11) The present quantity of transponders used for national (non-local) services would be frozen at the January 1, 2002 levels.

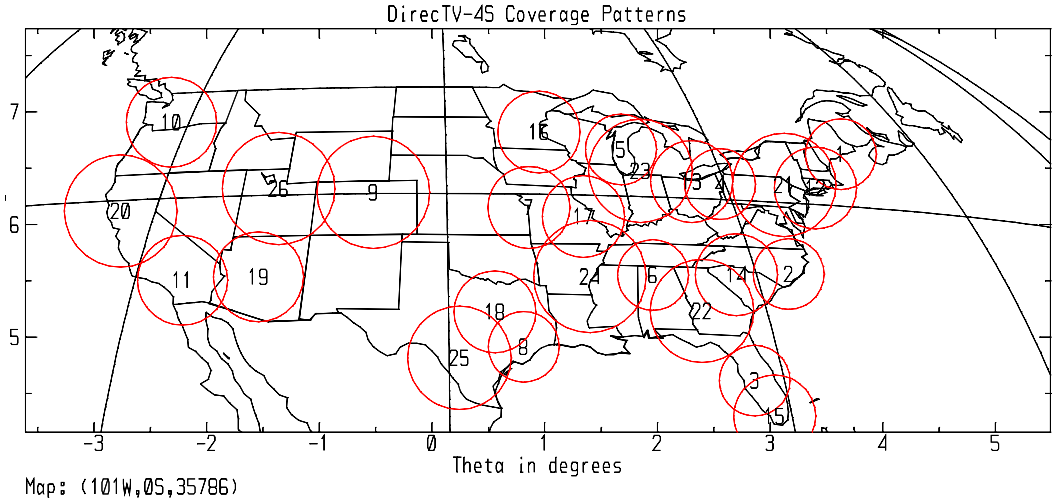
I gathered statistics and maps of the 210 DMAs in the United States. This data included the city (or cities) within each Nielsen DMA along with the number of eligible standard NTSC TV stations (STVs) eligible for carriage under the FCC's "carry one, carry all" rules, the TV households and the DMA ranking. The maps detailed the extent of each DMA down to the county level. To determine the number and location of eligible STVs, I used Appendix B to the Declaration of Jeffrey H. Rohlfs in *Satellite Broadcasting & Communications Ass'n. of America v. FCC*, No 00-1571-A (E.D. Va. 2001), a copy of which is attached hereto as Appendix H.

B. DirecTV.

I started with an analysis of the existing DirecTV-4S satellite. This was based on documents on file with the FCC by DirecTV. Direct (off-the-air) observations of the satellite were used to confirm this information. My observations are confined to those spot beam frequencies that cover my Clarksburg, Maryland site (outside of Washington, DC). In this case all six spot beam frequencies are visible. Obviously, only the nearby beams can be seen, however there was no visible deviation from what was filed. I have assumed that the rest of the nation matches DirecTV's FCC filing plans. The frequency plans for other cities were matched against data freely available on the Internet from DirecTV that verified the assumption.

I incorporated the beam center data on file at the FCC into a computer mapping program along with the beam sizes corresponding to the antenna gain for each of the 26 spot beams on six frequencies. I plotted the coverage patterns of all 26 beams as seen from the DirecTV-4S location at 101^{o} West Longitude (WL). See Figure 1.

FIGURE 1 DIRECTV-4S BEAM LOCATIONS



I individually plotted the coverages[5] of each of the six frequencies to study the beam separation. Table 1 shows the frequency plan on file with the FCC.

[5] I selected the 3 dB contours as the extent of coverage for DirecTV-4S and 7S. This was based on the shape of a Gaussian beam and the EIRP power levels at this contour. Beyond this contour, the interference from the adjacent beam(s) increases (due to DirecTV's use of closely spaced frequency reuse beams) and the pattern power drops rapidly. The DirecTV beams overlap through use of different frequencies. It became apparent that using a contour greater than 3 dB would not add many DMAs because they were often already being served by an adjacent beam.

TABLE 1 - FREQUENCY PLANS FOR DIRECTV-4S AND 7S IN THE 4S REPLACEMENT MODE

DirecTV-4S Spot Beam Frequency Utilization

New Beam		Frequency Number 4	12	18	20	26	28	Freqs. in Spot
1	1						28	1
2	2						28	1
3	3				20		28	2
4	4						28	1
5	5			18			28	2
6	6			18			28	2
7	7						28	1
8	8						28	1
9	9	4	12					2
10	10			18			28	2
11	11			18			28	2
12	12	4	12		20			3
13	13	4	12		20			3
14	14	4	12		20			3
15	15		12			26		2
16	16		12		20			2
17	17				20			1
18	18		12		20			2
19	19				20			1
20	20	4	12		20			3
21	21			18		26		2
22	22					26		1
23	23					26		1
24	24	4						1
25	25					26		1
26	26					26		1

In one case I discovered a frequency where two beams overlapped. Further research showed that one piece of data in Table 2 of the FCC filing was incorrect. Beam 16 is not centered on the Arizona/Utah border as indicated, but on the Minneapolis area. This error was discovered when I matched the current list of cities being served via DirecTV-4S to the beam locations. Proof of our discovery came later from pages 50 and 51 of the ITU filing data for DirecTV-4S. This type of cross-checking was needed because some data was sparse or inconsistent with other data.

With an understanding of how the DirecTV-4S was configured, I next analyzed how DirecTV was using this configuration. The first step was to overlay each of the 26 beams on portions of the Nielsen DMA map. From this I determined the DMAs fully

covered by the beam. In some cases only part of the DMA was covered. In general, I excluded these from the beam coverage. There were a few exceptions in the West where the uncovered areas were mostly desert, mountain or low population areas. A few of these were included on a case-by-case basis after considering the rain rate losses and the use of a larger antenna in these special cases.

Using both the technical data filed at the FCC and the DMA statistical data, I constructed a spreadsheet listing all 210 DMAs, by rank and number of eligible STV stations per market. Each of the 26 spot beams and the CONUS coverage beam, were provided a column. At the intersection of the DMA name and the beam(s) serving this DMA, the number of STV stations was entered when traffic was assigned. This service table also kept track of those DMAs with no service. Error-trapping methods were incorporated to verify the entries and to avoid double counting.

The number of frequencies per beam (taken from the FCC filing) and a video compression factor (a variable, but set at twelve[6]) provide a reasonable estimate of the beam's STV channel capacity.

DMA cities were assigned to one (or more) beam(s) starting from the largest population DMAs (e.g., New York City) towards the smaller DMAs until the channel capacity was exhausted. This closely followed DirecTV's present service to 41 DMAs. The absolute DMA rank was secondary to service to a city presently being served.

Another three-dimensional matrix (beam number, frequency numbers and cities) was constructed using data from DirecTV. This represents the actual current configuration of DirecTV-4S. See Appendix A. Only one of the cities had full carriage of all of what the FCC apparently contends are the eligible STV stations due to unknown reasons. Hence, currently, there are 390 STV channels (of which 10 are provided on a CONUS beam) for the 41 DMAs that DirecTV carries. However, for the 41 DMAs, there are 551 STVs eligible for coverage according to the FCC, and I assumed that all of these would be carried.

This matrix was used to configure the master matrix for DirecTV-4S. In other words, I started with the cities presently being served. This gave me the confidence of both beam number and frequency for each city. Next, I fit additional STVs around any

[6] See footnote 4.

spectrum left over after all of the eligible stations in the current city list are served. This had to be done on a beam-by-beam and frequency-by-frequency basis. The results on this analysis are shown in Appendix B.

The DMAs that were not accommodated were assigned to an unserved pool for later consideration with DirecTV-7S**.** Any DMAs remaining would be CONUS service candidates, if sufficient CONUS capacity remained after subtracting the national services. I then assigned capacity on the basis of the DMA rank. In most cases the selection was driven by the remaining capacity. If there were only five STV channels remaining, a six STV DMA could not be served, but a four or five station DMA could, even if it was a smaller market.[7] The remaining STV demands were put into the CONUS pot. The intent was to cover the maximum number of stations using spot beams, not to have pockets of unused capacity. Basically, the DirecTV-4S spot beam spectrum is filled; however, there is capacity for growth if the compression ratio could be increased.

The total number of licensed frequencies at each location to each operator was totaled. In the case of DirecTV, it controls all 32 frequencies at 101 WL. After deducting the spot frequencies (six in the case of DirecTV-4S), the remainder (32-6=26) are CONUS coverage. The CONUS frequencies were handled as a single block as stations can be moved from one CONUS frequency to another CONUS frequency without upsetting the block total. The number of nationwide CONUS channels (like CNN, MTV, etc.) must be deducted to find the CONUS capacity available to local station service. The nationwide count is based on direct observations.

In cases where the same DMA was covered by more than one beam, the multiple beams were considered in combination. The assignment (if capacity was available) was made in concert with the other demands in each beam.

I moved on to DirecTV-7S after DirecTV-4S was at capacity. Due to the lack of definitive DirecTV data on file at the FCC I was forced to use the following data from a Space Systems/Loral Press Release:[8] "In one operating mode, the new satellite will be

[7] Hence, just a small increase in video compression rates (from 12 to 13) would materially increase the number of DMAs served by these existing satellites.

[8] "Space Systems/Loral Awarded Contract to Build High-Power Spot Beam Satellite for DirecTV", September 6, 2001 found at http://www.loral.com/inthenews/010906.html.

capable of providing up to 54 transponders for high-quality local and national video service broadcast into 27 beams. In its other configuration, the satellite will be capable of providing up to 44 transponders broadcast into 30 beams."

Table 2 reduces this data into a more understandable form and compares it to DirecTV-4S.

TABLE 2 - DIRECTV SPOT BEAM SATELLITES

	DirecTV-4S at 101 W.L.	DirecTV-7S at 101 W.L. (DirecTV-4S replacement mode)	DirecTV-7S at 119 W.L.
FCC License	16 even , 16 odd	16 even, 16 odd	6 even, 5 odd
CONUS	10 even plus 16 odd from another satellite(s)	10 even plus 16 odd from another satellite(s)	0 even, 5 odd
Spots	6 even	6 even	6 even
Totals	32	32	11
CONUS frequencies	10	10	5
Spot frequencies	44	44	36
Alaska, Hawaii & PR	0	0	3
Total frequencies	54	54	44
CONUS beams	1	1	1
Spots beams (US)	26	26	26
Spots (offshore)	0	0	3
Total Beams	27	27	30

This implies that DirecTV-7S has two modes. The first (the 27 beam mode[9]) resembles the DirecTV-4S at 101 WL. This would be used if DirecTV-4S fails in orbit. (As indicated above, DirecTV-4S carries the largest DirecTV DMAs and thus the most revenue paying subscribers.) The second mode (44 transponders) is for use at 119 WL where DirecTV controls 11 frequencies.

I started by assuming the 26 DirecTV-7S spots would be at exactly the same locations as DirecTV-4S. To distinguish DirecTV-7S beams from the DirecTV-4S beams, all 7S beams are enclosed in a set of parenthesis in the spreadsheet. I then looked at the unserved capacity of each DirecTV-4S beam which had been temporarily placed in a CONUS pot of channels that could be at any of DirecTV's three locations (101, 110 or 119 WL).

[9] There may be 26 spot beams plus a CONUS beam in the 27 count. If this is the case I would expect that the other mode is 29 spots plus a CONUS beam.

If a DirecTV-4S spot beam at 101 WL had already fully served all of the top 100 DMAs in its beam, there was no need to have a duplicate beam from DirecTV-7S at 119 WL. Therefore, I assumed that beam would be relocated and used elsewhere. Lacking any detailed description of DirecTV-7S, I made educated decisions as to how the beams and frequencies could be used. See Table 3.

If a beam on DirecTV-4S had not been able to meet the demand in its coverage area, I placed a duplicate beam (using the same beam center longitude and latitude, but slightly different coverage due to the 18-degree difference in orbital locations) from DirecTV-7S into service. DirecTV-7S capacity was used to meet as much demand as possible (again giving preference to the largest population DMAs). When stations were assigned to DirecTV-7S spots, they were taken out of the CONUS pool to avoid double counting. Swaps between the CONUS pool and a spot beam were frequent as I attempted to get the best use of the scarce resources. The error trapping parts of the spreadsheet provided numerical protection for this very complex task.

I then moved on to the remaining beams. I already had plotted the beam centers and sizes for each of the DirecTV-4S beams on a frequency-by-frequency basis for each of the six frequencies. This gave us an understanding of the DirecTV beam separation plan for DirecTV-4S. I applied the same methodology to DirecTV-7S for the carried over and relocated beams.

I prepared regional maps of the individual beam coverage areas that had high quantities of unserved DMAs (by DirecTV-4S). I considered all DMAs. These maps used the 119 WL location for DirecTV-7S. This defined the areas needing beams and frequencies. As might be expected, these areas were along the East Coast, the Chicago area and states in the South.

Any unserved DMAs were assigned to a non-spot beam, if capacity was available (capacity on these beams was reserved for existing national programming). Table 4 lists the DMAs served by these non-spot beams. This established the extent of DMA coverage. See Appendix C.

FIGURE 2 DIRECTV-7S BEAM LOCATIONS

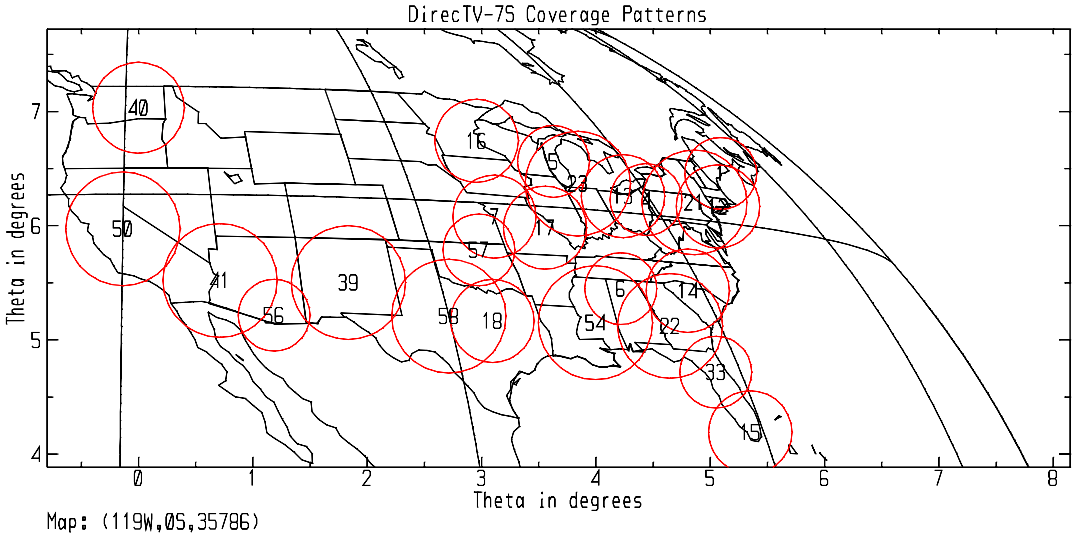


TABLE 3 - FREQUENCY PLAN FOR DIRECTV-7S AT 119 WL

DirecTV-7S Spot Beam Frequency Utilization

New Beam	Old	Frequency Number 4	12	18	20	26	28	Freqs. in Spot
1	1						28	1
2A	2						28	1
33	3			18				1
4	4						28	1
5	5			18			28	2
6	6			18			28	2
7	7						28	1
39	9	4						1
10A (40)	10			18				1
11A (41)	11			18			28	2
12	12	4	12		20			3
13	13	4	12		20			3
14	14	4	12		20			3
15	15		12					1
16	16		12					1
17	17				20			1
18	18		12					1
19A	19						28	1
20A (50)	20		12		20			2
21	21			18		26		2
22	22					26		1
23	23					26		1
24A (54)	24	4						1
58	25					26		1
56	26					26		1
39	New	4	12					2
57	New			18				1
59	PR						28	1

TABLE 4 - DirecTV NON-SPOT BEAM TRANSPONDERS

DMA	State	DMA No.	STVs
New York	NY	1	22
Los Angeles	CA	2	23
Chicago	IL	3	16
Houston	TX	11	17
Seattle-Tacoma	WA	12	15
Orlando-Daytona Beach-Melbourne	FL	21	15
Salt Lake City	UT	36	13
San Antonio	TX	37	13
Norfolk-Portsmouth-Newport News	VA	41	8
New Orleans	LA	42	10
Shreveport	LA	76	7
Portland-Auburn	ME	79	8
Champaign-Smithfield-Decater	IL	83	8
South Bend-Elkhart	IN	87	5
El Paso	TX	98	11

C. EchoStar.

The EchoStar process was very similar, but the scale was smaller (fewer and often smaller beams). For example, EchoStar-7's data on file at the FCC shows 15 spots of which only 12 are on the 48 states[10] as compared to 26 from DirecTV-4S. DirecTV-4S's beams have several sizes while the EchoStar's filing is for a uniform size. The EchoStar beams reusing the same frequencies are spaced further apart than the DirecTV beams. This allowed consideration of a 5-dB edge of coverage contour. To test this selection I used the computer program to show the effect of the satellite antenna pointing errors (as specified in the FCC filing). From this study, I concluded that the anticipated pointing errors could cause the signal level to fluctuate too much at cities beyond the 5-dB contour. These fluctuations would be magnified by rain losses. This could mean the signal would fail under a worst case combination of heavy rain and maximum pointing error conditions. Therefore, I stopped at the 5-dB contours. The beam size, separation and gain data provided by EchoStar both points towards the 5-dB contour as being a reasonable edge definition. The wider separation between frequency reuse beams means the interference will be lower than DirecTV at the same 5-dB contour.

A similar, but smaller service chart was constructed to map out the amount of spectrum EchoStar assigned to each beam and to keep track of unservable DMAs. A computer plot was prepared for the 15 EchoStar-7 beams. See Figure 3. The frequency plan is based on the FCC filing and is given in Table 5.

[10] The remaining three beams cover Hawaii (beam number 1), Alaska (beam number 2) and Mexico City (beam number 8).

FIGURE 3 ECHOSTAR-7 BEAM LOCATIONS

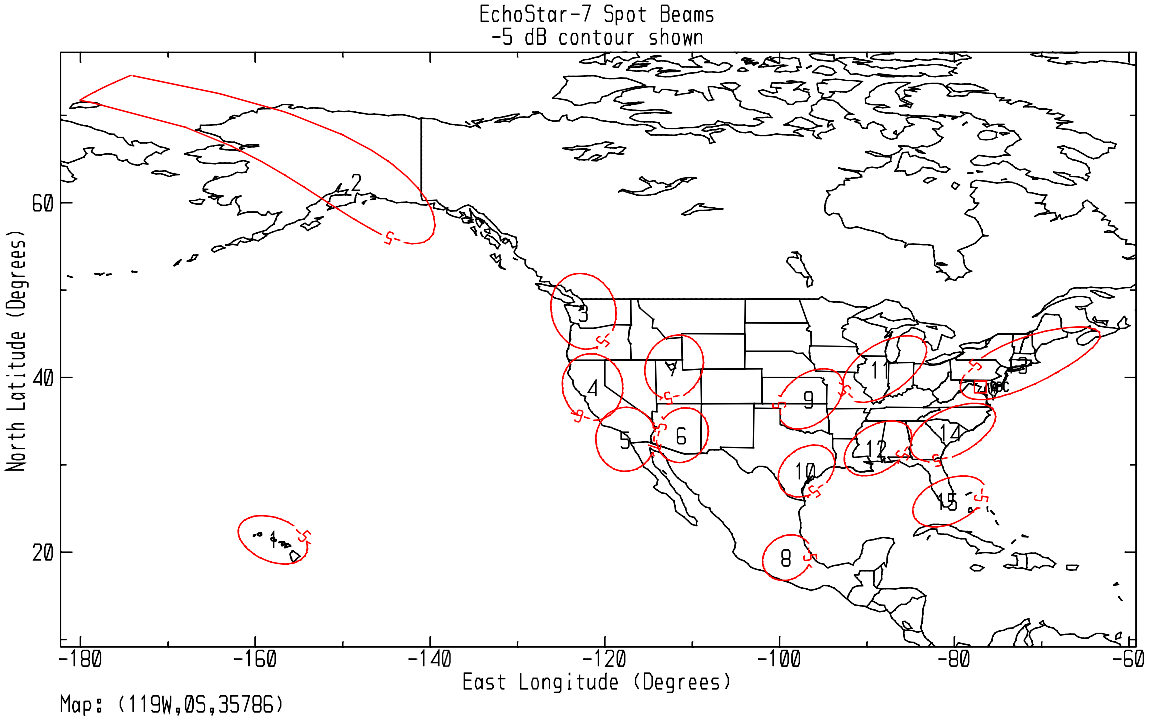


TABLE 5 - ECHOSTAR-7 FREQUENCY PLAN

EchoStar-7 Spot Beam Frequency Utilization

New Beam		Frequency Number 1	3	5	7	9	(not used)	Freqs. in Spot
Hawaii 1	1					9		1
Alaska 2	2					9		1
3	3	1	3					2
4	4			5	7			2
5	5	1	3					2
6	6			5	7			2
7	7					9		1
8	8					9		1
Mexico 9	9	1	3					2
10	10			5	7			2
11	11			5	7			2
12	12					9		1
13	13	1	3					2
14	14			5	7			2
15	15	1	3					2

EchoStar-8 is described in the Joint Engineering Statement as "EchoStar 7 and 8 were each designed to operate with 16 high power transponders and, by operating on five other frequencies re-used 5 times, 25 spot-beam transponders"[11]. This statement has two implications. The first is that the two satellites are essentially identical, as far as frequency counts are concerned. The second is that EchoStar-8 might be a replacement for EchoStar-7 if there is a launch or in-orbit failure. See Table 6.

[11] Joint Engineering Statement at 5.

TABLE 6 - ECHOSTAR SPOT BEAM SATELLITES

	EchoStar 7 at 119 WL	EchoStar 8 at 110 WL
FCC License	**10 even, 11 odd**	**13 even, 16 odd**
CONUS	**6 odd plus 10 even ***	**11 odd plus 13 even***
Spots	**5 odd**	**5 odd**
Totals	**21**	**29**
CONUS frequencies	**16**	**24**
Spot frequencies	**22**	**22**
Alaska, Hawaii & Mexico	**3**	**3**
Total frequencies	**41**	**41**
CONUS beams	**1**	**1**
Spot beams (US)	**12**	**12**
Spots (offshore)	**3**	**3**
Total beams	**16**	**16**

* EchoStar has stated that it intends to transition all CONUS traffic at 119 WL to EchoStar 7.[12] I have made the same assumption for EchoStar 8 at 110 WL.

Therefore, I started with the supply and demand for STV capacity on EchoStar 7 at 119 WL. Unserved STV stations could be handled be either EchoStar-8 (at 110 WL) or by EchoStar capacity at 61.5 or 148 WL.

Using the list of 36 DMAs served by EchoStar on 1 January 2002 and the orbital locations from which the service was being provided, I constructed maps of the United States for each of these locations showing what percentage of each city was being served from each orbital location. I found that cities to the East of a line running from the Texas/Louisiana border to the North Dakota/Minnesota border were served from 61.5 WL. West of this line, the service was from 148 WL.[13] Many cities were being served from 110 WL and some from 119 WL. See Appendix D.

Appendix E lists the cities served and not served by EchoStar-7 along with the number of eligible STV stations.

[12] Application of EchoStar Satellite Corporation for Minor Modification of DBS Authorization, Launch and Operating Authority for EchoStar 7, Files 88-01 and 88-02, page 4, Footnote 8, August 10, 2001.

[13] These cities have elevations of 15 degrees or greater to 61.5 or 148 WL.

After EchoStar-8 is successfully placed into service (in 2002 according to the Joint Engineering Statement), I have assumed the STVs presently assigned to 110 WL will be served by EchoStar-8 via spot beams.

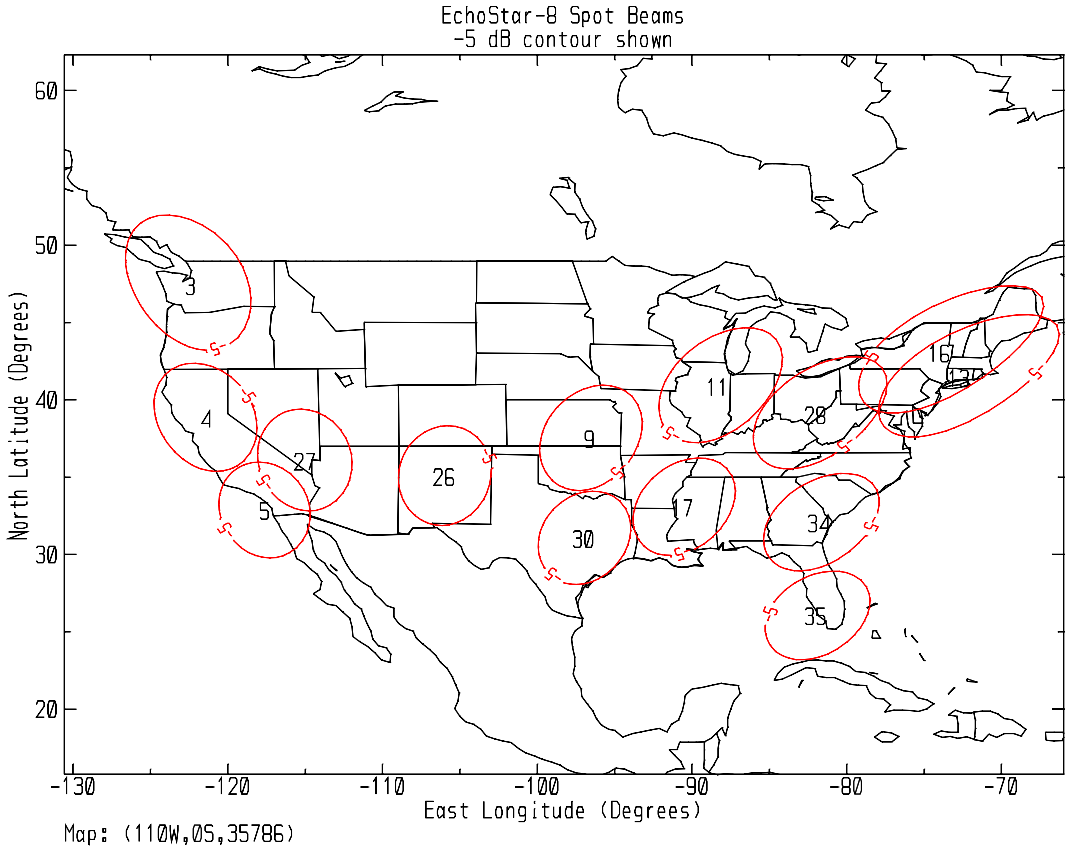
Figure 4 shows the estimated coverage areas for EchoStar-8, this is one of many possible plans. I tried to optimize the coverage of the top population DMAs not served by EchoStar-7. Table 7 shows one possible frequency plan.

TABLE 7 - ECHOSTAR-8 FREQUENCY PLAN

EchoStar-8 Spot Beam Frequency Utilization

New Beam Number	Old	Frequency Number 1	3	5	7	9	(not used)	Freqs. in Spot
3	3	1	3					2
4	4			5	7			2
5	5	1						1
26	6				7	9		2
27	7		3					1
28	8				7			1
9	9				7			1
30	10	1	3	5				3
11	11	1	3	5				3
17	12					9		1
13	13	1	3	5				3
34	14	1	3					2
35	15			5	7			2
16	New					9		1
PR	New					9		1

FIGURE 4 ECHOSTAR-8 BEAM LOCATIONS



I utilized all of the spectrum licensed to EchoStar at 61.5 (11 transponders), 110 (29), 119 (21) and 148 (32 including the STAs). In the Gulf states (where there is higher rainfall), I preferred either a high powered spot or 61.5 WL transponder capacity. The 61.5 was preferred over 110 or 119 WL due to the higher elevation angle which reduces the length of the path through rain and thus gives a better signal in rain. Because of the limited number of beams and the limited spectrum in a spot, it was sometimes necessary to split the STVs in a city across several orbital locations, which is apparently EchoStar's plan as well. See Appendix F.

Special TV station cases (like WSBK-Boston and WGN-Chicago) are served from 119 WL via a CONUS transponder. Table 8 lists the DMAs where the demand for spot service exceeded the supply; therefore non-spot beam transponders were used in my model.

TABLE 8 - ECHOSTAR NON-SPOT BEAM TRANSPONDERS

DMA	State	DMA No.	STVs
Philadelphia	PA	4	18
Detroit	MI	9	9
Houston	TX	11	17
Minneapolis-St. Paul	MN	13	13
Cleveland	OH	15	14
Denver	CO	18	15
Orlando-Daytona Beach-Melbourne	FL	21	15
Hartford & New Haven	CT	27	9
Charlotte	NC	28	12
Raleigh-Durham	NC	29	12
Nashville	TN	31	12
Cincinnati	OH	32	9
Columbus, OH	OH	34	7
Salt Lake City	UT	36	13
Memphis	TN	40	9
Norfolk-Portsmouth-Newport News	VA	41	8
West Palm Beach-Fort Pierce	FL	43	10
Buffalo	NY	44	10
Harrisburg-Lancaster-Lebanon-York	PA	46	7
Greensboro-High Point-Winston Salem	NC	47	9
Louisville	KY	48	10
Providence-New Bedford	RI	49	8
Albuquerque-Santa Fe	NM	50	15
Wilkes Barre-Scranton	PA	52	7
Jacksonville-Brunswick	FL	53	10
Dayton	OH	55	7
Albany-Schenectady-Troy	NY	56	7
Wichita-Hutchinson	KS	65	10
Omaha	NB	75	7
Spokane	WA	77	9
Springfield, MO	MO	78	6
South Bend-Elkhart	IN	87	5
El Paso	TX	98	11
Bakersfield	CA	130	4
Parkersburg	WV	185	1
Charlottesville	VA	193	2

In theory, the easiest way to cover the top N (say 100 or 110) DMAs would be to fashion a satellite with N spot beams, each configured to the present shape of one DMA. This is an unrealistic approach. That type of precision beam shaping is not available now or in the foreseeable future.

Reality teaches that, like a fisherman's net, each beam covers a wide range of species of DMAs. Hopefully, the large DMAs will be captured, but the small fish will not be served. Each beam has a finite amount of interference-free capacity (spectrum). If the number of spot beam frequencies is raised from five (EchoStar) or six (DirecTV) to a larger number, more spectrum can be added to the more critical beams, thus serving more STVs and DMAs. This reduces the CONUS capacity unless the spot beam frequency comes from a non-CONUS orbital slot.

In conclusion, Table 9 summarizes the results for DirecTV-4S and DirecTV-7S, and EchoStar7 and EchoStar-8. However, I have no doubt that with more time, I would be able to increase the DMA count. I also have no doubt that EchoStar's and DirecTV's engineers, who will have many months to perform this task, would be able to increase the DMA count even further.[14]

TABLE 9 - DMA COUNTS

	Top 100	DMAs 101-210	Totals
DirecTV (with DirecTV-1, 1R, 2, 3, 4S, 5, 6 AND 7S)			
DMAs served	**91**	**19**	**110**
DMAs unserved	**9**	**91**	**100**
Total DMAs	**100**	**110**	**210**
EchoStar (with EchoStar 1 to 8)			
DMAs served	**69**	**11**	**80**
DMAs unserved	**31**	**99**	**130**
Total DMAs	**100**	**110**	**210**

Based on the foregoing analysis, I conclude that if the merger is not consummated, DirecTV will be able to provide local channels to approximately 110 DMAs.

Based on the foregoing, I conclude that if the merger is not consummated, EchoStar will be able to provide local channels to approximately 80 DMAs using only satellites already in orbit or satellites currently on order.

[14] There are some areas of the nation (for example, the Kentucky/Tennessee area) where interference restrictions make it difficult to provide coverage. Providing spot-beam coverage from an additional frequency would result in these and other areas probably being served, thus raising the DMA counts.

D. Opportunities To Increase Channel Capacity.

For purposes of this Declaration, I have used a compression ratio of 12:1, which is at the present state of the art. Based on the historical rate of increase of compression technology, this compression ratio may increase over time, thus allowing both DirecTV and EchoStar to distribute more channels.

I used existing modulation methods. More advanced modulation methods could result in an increase in capacity. However, this would entail modification of (or an addition to) the existing set-top boxes.

The simplest way to increase the number of DMAs and stations served would be to add additional frequencies from the CONUS transponder pool.

With the addition of the three frequency satellite EchoStar and DirecTV could be capable of serving 160 (76%) and 187 (90%) of all DMAs respectively. It would be reasonable to expect, given the rapid changes in the technologies discussed above that 100% of the DMAs could be technically served. **Accordingly, both companies could cover all 210 DMAs while continuing to provide the hundreds of channels they carry today, simply by using additional spot-beam technology to more effectively utilize the spectrum.**

In addition, smaller spot beams could be used but this may require a larger spacecraft antenna and more complex antenna deployment mechanisms in orbit. Satellites with very small spot beams (such as Thuraya and ACES) have flown designs with over 100 beams.

The introduction of a dual conditional access method would allow both operators to share a beam. Even if a merger is denied, this could provide competition at the local level, even if only one operator provides beam coverage.

Shaped antenna beams might reduce the beam-to-beam frequency reuse separation. DirecTV's approach is already aggressive when compared to the more conservative EchoStar spacing.

III. USING SPOT-BEAM TECHNOLOGY ON THREE ADDITIONAL FREQUENCIES.

I considered how many more DMAs could be served using spot beam technology on just three additional frequencies. This would entail each company launching an additional satellite. If the company desired to reach more than the DMAs listed below (or all of the DMAs), it could do so simply by increasing the number of frequencies using spot beams. Both companies have sufficient capacity to reach substantially all or all 210 DMAs using existing technology while still keeping the same number of programs they have today. Increases in compression and spot-beam technology would allow them to add to their channel selections.

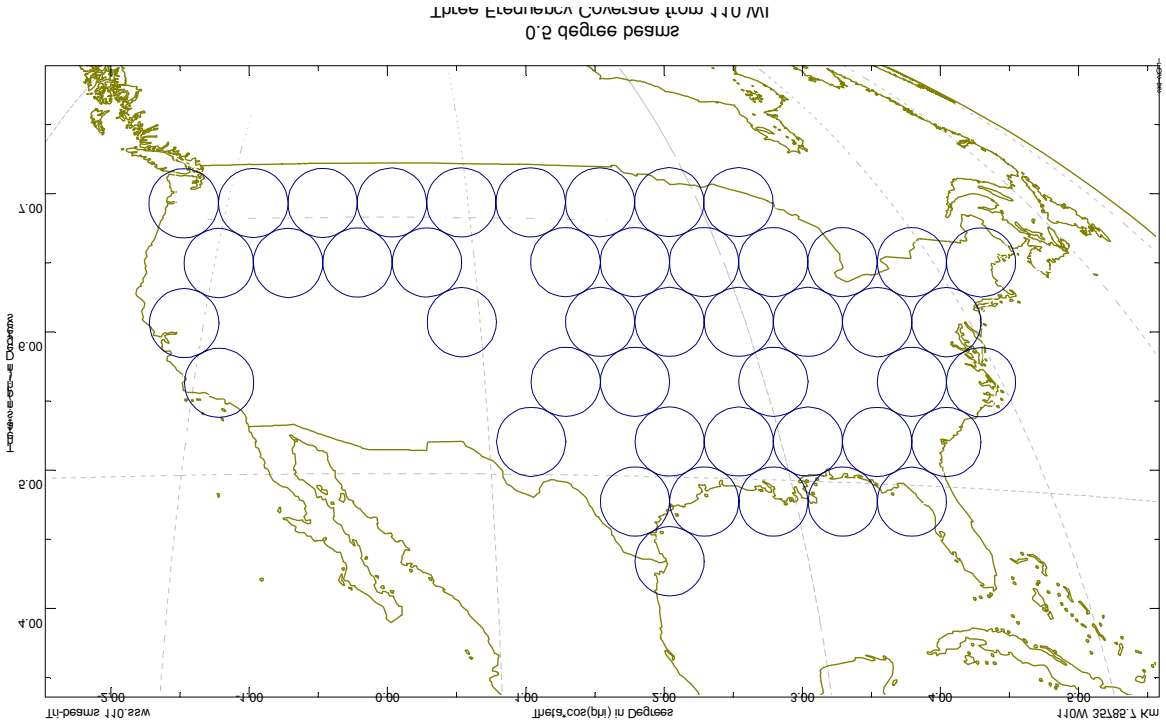
I considered all five currently used BSS slots (61.5 to 148 WL). The footprints of the three center locations (101 to 119 WL) were similar. We selected the center (110 WL) location, but could have picked 101 or 119 WL with similar results being expected. There are other ways available using the outer (61.5 and/or 148 WL) slots, but we did not investigate these opportunities.

The methodology consisted of manually plotting the DMAs unserved by the DirecTV and EchoStar satellites on a map. A series of approximately 50 0.5-degree spot beams were then placed over these DMAs. Each spot has access to only one of the three new frequencies. The number of STVs for each covered DMA was also indicated. At a 12:1 compression ration, the maximum number of STVs was 12 per beam. In theory, there is enough capacity for about 600 stations, but realities of population and STV distribution limit the real capacity to a lower value. When making assignments of capacity to the DMAs within each beam, preference was given to the larger population DMAs. The spectrum limitations sometimes forced a different selection. In some cases two small population DMAs could be accommodated, but there was not enough spectrum for a larger population DMA. The goals were: a) to satisfy as many of the top 100 markets that were still unserved after the existing and in production satellites were used and b) to maximize the total number of DMAs served.

A. DirecTV

Figure 5 shows the additional coverage based on the three frequencies. The service limits were set at the 3-dB contour.

FIGURE 5 – DIRECTV ADDITIONAL COVERAGE BEAM PLAN



Since the intent was to provide supplemental service to the unserved DMAs, there are gaps in Figure 5. These are areas where DirecTV already had sufficient capacity on its current and planned (DirecTV-5 and 7S) satellites.

Three frequencies are used. In the case of DirecTV, it has sufficient capacity at 101 WL, 110 WL, and 119 WL, with 110 and 119 WL being the most likely candidates. The average frequency reuse is approximately 15:1.[15] This is based on 46 beams divided by three frequencies.

[15] Frequency reuse of 15:1 (or 17:1 for EchoStar) is well within the range of current technology. For comparison, Celsat reuses 12 frequencies 480 times (40:1). Both the ACeS (Asian Cellular Satellite) and the Thuraya satellites are in orbit and in service. ACeS carries 154 beams and Thuraya has over 200 beams at 0.3 degrees each. These are L- and S-band systems, but illustrate that higher than 17:1 reuse factors are possible. EchoStar and WildBlue's Ka-band applications have 12:1 ratios.

If a DMA fell in the triangular area between the beams, it was not entered into the list of cities out of concern over interference from adjacent co-frequency beams. There were a few instances where a DMA just beyond the edge of a beam was served, but the city needed to be in the direction where there were no other beams. These cases, which were few, were along the national borders, oceans and in desert areas.

Table 10 lists the additional cities covered in the DirecTV case. There are 24 columns and seven rows of beams in Figure 1. Each beam is identified by its row and column number.

Table 10 – Beam Coverage by a Three Frequency DirecTV Spot Beam Satellite at 110 WL

Beam	Primary DMAs Served Rank & STVs	DMAs In Beam But Not Served Rank & STVs
Row 1		
Column 1	**Eugene, OR 122, 6**	
Column 3	**Yakima, WA 125, 5**	
Column 5	**Missoula, MT 170, 4** **Great Falls, MT 187, 3** **Butte-Bozeman, MT 190, 4**	**Helena, MT 207, 2**
Column 7	**Billings, MT 169, 4** **Glendive, MT 210, 1**	
Column 9	**Minot-Bismarck-Dickinson, ND 152, 6** **Rapid City, SD 175, 6**	
Column 11	**Sioux Falls, SD 111, 8**	**Fargo-Valley City, ND 120, 6**
Column 13	**Duluth-Superior, MN 132, 5** **Mankato, MN 195, 1**	
Column 15	**Marquette, MI 177, 4** **Wausau-Rhinelander, WI 136, 5**	
Column 17	**Traverse City-Cadillac, MI 119, 5**	
Row 2		
Column 2	**Medford-Klamath Falls, OR 141, 6**	
Column 4	**Boise, ID 123, 6**	
Column 6	**Idaho Falls-Pocatello, ID 164, 5** **Twin Falls, ID 188, 3**	
Column 8	**Casper-Riverton, WY 197, 4**	
Column 12	**North Platte, NB 209, 3**	
Column 14	**Lincoln-Hastings-Kearney, NB 101, 5** **Sioux City, NB 144, 6**	
Column 16	**Davenport-Rock Island-Davenport, IA 90, 6** **Rochester-Mason City-Austin, MN 153, 6**	
Column 18	**Peoria-Bloomington, IL 112, 6** **Lafayette, IN 194, 1**	
Column 20	**Lansing, MI 107, 6** **Alpena, MI 208, 2** **Lima, OH 201, 3**	
Column 22	**Erie, PA 142, 5** **Utica, NY 168, 3** **Elmira, NY 171, 3**	Watertown, NY 176, 3
Column 24	**Bangor, ME 155, 5** **Presque Isle, ME 205, 2**	
Row 3		
Column 1	**Monterey-Salinas, CA 118, 5** **Chico-Redding, CA 133, 5**	Eureka, CA 191, 5
	Grand Junction, CO 186, 5	

Beam	Primary DMAs Served Rank & STVs	DMAs In Beam But Not Served Rank & STVs
Column 9		
Column 13	**Wichita-Hutchinson, KS 65, 10**	
Column 15	**Topeka, KS 138, 4**	
Column 17	**Columbia-Jefferson City, MO 143, 5** **Joplin-Pittsburg, MO 145, 4**	**Quincy-Hannibal-Keokuk, IL 163, 4**
Column 19	**Evansville, IN 97, 8** **Bowling Green, KY 181, 4**	**Terre Haute, IN 139, 5**
Column 21	**Charleston-Huntington, WV 61, 12**	**Wheeling-Stubenville, WV 140, 3** **Clarksburg-Weston, WV 165, 4** **Parkersburg, WV 185, 1**
Column 23	**Salisbury, MD 162, 4** **Harrisonburg, VA 179, 3** **Charlottesville, VA 193, 2**	
Row 4		
Column 2	**Bakersfield, CA 130, 4**	
Column 12	**Amarillo, TX 127, 5** **Lubbock, TX 147, 7**	
Column 14	**Tulsa, OK 59, 12**	
Column 18	**Jackson, TN 184, 3**	
Column 22	**Bluefield-Beckley-Oak Hill, WV 149, 4**	
Column 24	**Greenville-New Bern-Washington, NC 106, 8** **Wilmington, NC 148, 4**	
Row 5		
Column 11	**Odessa, TX 151, 6**	
Column 15	**Hattiesburg-Laurel, MS 167, 2**	
Column 17	**Fort Smith-Fayetteville-etc. AR 115, 5** **Monroe-El Dorado, LA 134, 6**	**Jonesboro, AR 180, 3**
Column 19	**Mobile-Pensacola, AL 62, 11**	**Jackson, MS 88, 5** **Montgomery, AL 116, 7** **Columbus-Tupelo-West Point, MS 131, 4** **Biloxi-Gulfport, MS 157, 3** **Meridian, MS 183, 4**
Column 21	**Macon, GA 121, 6** **Albany, GA 150, 6**	**Dothan, AL 172, 3** **Columbus, GA 128, 6**
Column 23	**ıugusta, GA 113, 6** **'lorence-Myrtle Beach, SC 114, 5**	
Row 6		

Beam	Primary DMAs Served Rank & STVs	DMAs In Beam But Not Served Rank & STVs
Column 14	**Laredo, TX 189, 4**	
Column 16	**Corpus Christi, TX 129, 5** **Beaumont-Port Arthur, TX 137, 4** **Victoria, TX 204, 2**	
Column 18	**Baton Rouge, LA 96, 5** **Lafayette, LA 124, 4** **Lake Charles, LA 173, 3**	**Alexandria, LA 178, 4**
Column 20	**Panama City, FL 158, 5**	
Column 22	**Gainesville, FL 166, 4**	
Row 7		
Column 15	**Harlingen-Weslaco-Brownsville-etc. TX 102, 9**	

Additional beams could cover Alaska, Hawaii or Puerto Rico.

Based on the foregoing, I conclude that if DirecTV launches just one additional satellite beyond those on order, with spot-beam technology on only three additional frequencies, DirecTV will be able to serve a total of 187 DMAs, leaving only 23 unserved.

Table 11 shows the number of DirecTV DMAs served with and without the additional three frequencies.

TABLE 11 – COMPARISON OF DIRECTV DMA COVERAGES

	Top 100	DMAs 101-210	Totals
DirecTV (with DirecTV-1, 1R, 2, 3, 4S, 5, 6 and 7S)			
DMAs served	**91**	**19**	**110**
DMAs unserved	**9**	**91**	**100**
Total DMAs	**100**	**110**	**210**
DirecTV (with DirecTV-1, 1R, 2, 3, 4S, 5, 6 and 7S plus an all-spot satellite at 110WL)			
DMAs served	**98**	**89**	**187**
DMAs unserved	**2**	**21**	**23**
Total DMAs	**100**	**110**	**210**

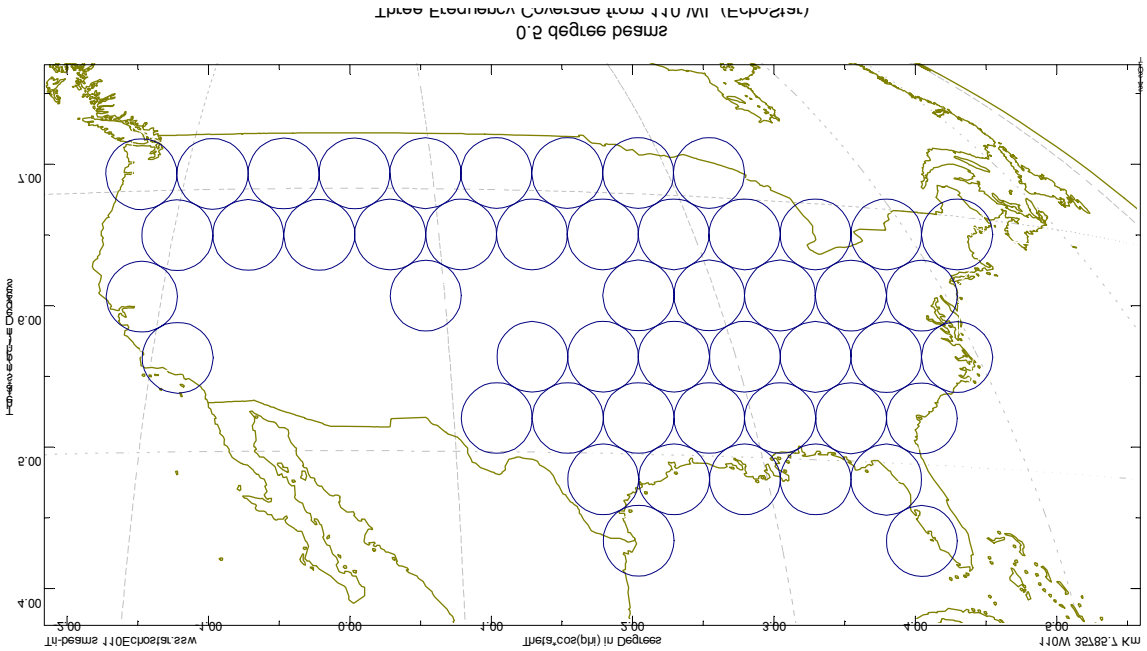
B. EchoStar.

In the case of EchoStar, there are 29 CONUS transponders presently in use at 110 WL, its primary local-into-local location. Many of these might transition to these new spots at 110 W.L. Some nation-wide services also come from this location. EchoStar-8 will go to this location. It will consume five frequencies. Use of an additional satellite based on spot beams using three of the remaining 24 frequencies would provide benefits similar to DirecTV's. Therefore, the 110 WL was selected for the additional EchoStar spots.

The EchoStar choices for the three frequencies at 110 WL are broad and could use all-even, all-odd numbered licensed transponders or a mixture. Recall that there are basic and quite significant differences between the spot beam plans of the two operators. DirecTV has an aggressive plan with several beam sizes, up to three frequencies per beam, overlapping and closely spaced beams and approximately twice as many beams on the 48 states. EchoStar is much more conservative with fewer, widely spaced and generally narrower beams. Three of the beams fall outside the lower 48 states (on Hawaii, Alaska and Mexico City). Only five, instead of six, frequencies are devoted to spots and the frequency reuse is lower. This results in far fewer square miles of spot beam coverage than DirecTV. With less area covered, it should not be a surprise that the number of DMAs served is lower than DirecTV.

Figure 6 shows the spot beams I selected for the additional three-frequency EchoStar configuration. This differs from Figure 5 because the basic system designs (based on the current and in-production satellites) are so different. To allow comparison between the two three-frequency models I set the beamwidths and beam center locations constant. The service limits were set at the 3 dB contour.

FIGURE 6 –ECHOSTAR ADDITIONAL COVERAGE PLAN



The STVs and DMAs served by a particular beam (at the identical row and column location in the two models) are usually different than in the DirecTV case. With more of the top 100 DMAs unserved by the basic EchoStar design, these cities took traffic in these new beams away from medium to low population DMAs. The DMAs served by each spot needed to be analyzed independent of the assignments made to DirecTV. A comparison of Tables 10 and 12 shows these changes.

TABLE 12-BEAM COVERAGE BY A THREE-FREQUENCY ECHOSTAR SPOT BEAM SATELLITE AT 110 WL

Beam	Primary DMAs Served Rank & STVs	DMAs In Beam But Not Served Rank & STVs
Row 1		
Column 1	**Eugene, OR 122, 6**	
Column 3	**Yakima, WA 125, 5**	
Column 5	**Missoula, MT 170, 4** **Great Falls, MT 187, 3** **Butte-Bozeman, MT 190, 4**	**Helena, MT 207, 2**
Column 7	**Billings, MT 169, 4** **Glendive, MT 210, 1**	
Column 9	**Minot-Bismarck-Dickinson, ND 152, 6** **Rapid City, SD 175, 6**	
Column 11	**Sioux Falls, SD 111, 8**	**Fargo-Valley City, ND 120, 6**
Column 13	**Duluth-Superior, MN 132, 5** **Mankato, MN 195, 1**	
Column 15	**Marquette, MI 177, 4** **Wausau-Rhinelander, WI 136, 5**	
Column 17	**Traverse City-Cadillac, MI 119, 5**	
Row 2		
Column 2	**Medford-Klamath Falls, OR 141, 6**	
Column 4	**Boise, ID 123, 6**	
Column 6	**Idaho Falls-Pocatello, ID 164, 5** **Twin Falls, ID 188, 3**	
Column 8	**Casper-Riverton, WY 197, 4**	
Column 12	**North Platte, NB 209, 3**	
Column 14	**Lincoln-Hastings-Kearney, NB 101, 5** **Sioux City, NB 144, 6**	
Column 16	**Davenport-Rock Island-Davenport, IA 90, 6** **Madison WI 84, 6**	**Cedar Rapids-Waterloo-Dubuque, IA 89, 7** **LaCrosse-EauClaire, WI, 126, 5** **Rochester-Mason City-Austin, MN 153, 6** **Ottumwa-Kirksville, MO 199, 2**
Column 18	**Peoria-Bloomington, IL 112, 6** **Lafayette, IN 194, 1**	
Column 20	**Flint-Saginaw-Cay City, MI, 64, 8** **Alpena, MI 208, 2** **Lima, OH 201, 3**	**Toledo, OH, 67, 6** **Lansing, MI 107, 6**
Column 22	**Rochester, NY 74, 5** **Syracuse, NY 80, 7**	**Erie, PA 142, 5** **Utica, NY 168, 3** **Elmira, NY 171, 3**

Beam	Primary DMAs Served Rank & STVs	DMAs In Beam But Not Served Rank & STVs
		Watertown, NY 176, 3
Column 24	**Portland-Auburn, ME 79, 8** **Springfield-Holyoke, MA 105, 3**	**Bangor, ME 155, 5** **Presque Isle, ME 205, 2**
Row 3		
Column 1	**Chico-Redding, CA 133, 5** **Eureka, CA 191, 5**	
Column 9	**Grand Junction, CO 186, 5** **Colorado Springs-Pueblo, CO 92, 5**	
Column 15	**St. Joseph, MO 192, 2**	
Column 17	**Columbia-Jefferson City, MO 143, 5** **Joplin-Pittsburg, MO 145, 4**	**Quincy-Hannibal-Keokuk, IL 163, 4**
Column 19	**Evansville, IN 97, 8** **Bowling Green, KY 181, 4**	**Terre Haute, IN 139, 5**
Column 21	**Charleston-Huntington, WV 61, 12**	**Wheeling-Steubenville, WV 140, 3** **Clarksburg-Weston, WV 165, 4** **Zanesville, OH 202, 1**
Column 23	**Salisbury, MD 162, 4** **Harrisonburg, VA 179, 3**	
Row 4		
Column 2	**Santa Barbara-Santa Maria-San Luis, CA 117, 5**	
Column 12	**Amarillo, TX 127, 5** **Lubbock, TX 147, 7**	
Column 14	**Sherman-Ada 161, 2**	
Column 18	**Jackson, TN 184, 3**	
Column 22	**Roanoke-Lynchburg, VA 68, 7**	**Bluefield-Beckley-Oak Hill, WV 149, 4**
Column 24	**Greenville-New Bern-Washington, NC 106, 8** **Wilmington, NC 148, 4**	
Row 5		
Column 11	**Odessa, TX 151, 6**	
Column 15	**Tyler-Longview, TX 108, 3**	
Column 17	**Fort Smith-Fayetteville-etc. AR 115, 5**	**Jonesboro, AR 180, 3**

Beam	Primary DMAs Served Rank & STVs	DMAs In Beam But Not Served Rank & STVs
	Monroe-El Dorado, LA 134, 6	
Column 19	**Mobile-Pensacola, AL 62, 11**	**Montgomery, AL 116, 7** **Columbus-Tupelo-West Point, MS 131, 4** **Biloxi-Gulfport, MS 157, 3** **Meridian, MS 183, 4**
Column 21	**Macon, GA 121, 6** **Albany, GA 150, 6**	**Dothan, AL 172, 3** **Columbus, GA 128, 6**
Column 23	**Savannah, GA 100, 7** **Florence-Myrtle Beach, SC 114, 5**	**Charleston, SC 103, 6** **Augusta, GA 113, 6**
Row 6		
Column 14	**Laredo, TX 189, 4**	
Column 16	**Corpus Christi, TX 129, 5** **Beaumont-Port Arthur, TX 137, 4**	
Column 18	**Baton Rouge, LA 96, 5** **Lafayette, LA 124, 4** **Lake Charles, LA 173, 3**	**Alexandria, LA 178, 4**
Column 20	**Panama City, FL 158, 5**	
Column 22	**Gainesville, FL 166, 4** **Tallahassee-Thomasville, FL 110, 5**	
Row 7		
Column 15	**Harlingen-Weslaco-Brownsville-etc. TX 102, 9**	

The EchoStar model uses 50 beams for an average frequency reuse of 17:1.

If a DMA fell between the beams, it was not entered into the list of cities out of concern over interference from adjacent co-frequency beams. There were a few instances where a DMA just beyond the edge of a beam was served, but the city needed to be in the direction where there were no other beams. These cases, which were few, were along the national borders, oceans and in desert areas.

Based on the foregoing, I conclude that if EchoStar launches just one additional satellite beyond those on order, with spot-beam technology on only three additional frequencies, EchoStar will be able to serve a total of 160 DMAs, leaving only 50 unserved.

Table 13 shows the number of EchoStar DMAs served with and without the additional three frequencies.

TABLE 13 – COMPARISON OF ECHOSTAR DMA COVERAGES

	Top 100	DMAs 101-210	Totals
EchoStar 1 to 8			
DMAs served	**69**	**11**	**80**
DMAs unserved	**31**	**99**	**130**
Total DMAs	**100**	**110**	**210**
EchoStar 1 to 8 plus an all-spot satellite at 110WL)			
DMAs served	**84**	**76**	**160**
DMAs unserved	**16**	**34**	**50**
Total DMAs	**100**	**110**	**210**

C. Conclusion

The addition of the three spot beam frequencies has helped the DMA penetration of both operators. Approximately 85 DMAs (or about 40%) were added in each system.

Even with these additional resources, both operators would be serving over 150 DMAs. This still allows for transmission of all existing national programming and may allow for even more local programming should spot-beam technology be used on additional frequencies or should video compression technology increase.

My analysis is also significant for what it does not do. It did not require additional frequency bands (Ka or others). It did not obsolete millions of existing set-top boxes. It did not require new orbital slot assignments. It did not push up the compression ratio beyond the current 12:1 and thus protected the quality of existing STV services.

It is difficult to give a good estimate of the cost of a three-frequency 50 spot satellite. One clue comes from a comparison of the insured values of the hybrid CONUS/spot DirecTV-4S and the all-CONUS DirecTV-5. The DirecTV-4S was insured

for $200 million as compared to $215 million[16] for DirecTV-5. The same pattern is repeated for the EchoStar satellites ($200 million vs. $215 million for EchoStar's 7 and 6). The DirecTV-4S and EchoStar 7 still carry many high powered (around 200 watts) CONUS transponders.

A smaller spot-beam satellite, using spots on only 3 or 4 frequencies should be able to be built, launched, and insured for not more than these amounts. Accordingly, if each company spends another $200 million or so for an in-orbit satellite, it will have enough capability to provide more local-into-local then the merged company says it will provide after the merger.

IV. BROADBAND.

A. Introduction.

Using technical data from existing authorizations, I determined whether EchoStar and Hughes can, standing alone, reach an alleged "critical mass" of at least 5 million broadband customers with their existing inventory of CONUS Ka-band slots. I assumed access to full spectrum (1000 MHz) at each of the slots.

B. Methodology.

I obtained the original filings for the Hughes Network Systems/PanAmSat SPACEWAY,[17] EchoStar, Celsat and VisionStar systems from our library. Some of these filings are dated 1995 but I have used the applications for minor modifications filed in 2000 by EchoStar for its system and the 2001 filing by Hughes for its SPACEWAY GSO FSS satellite systems. The Celsat America Amendment dated September 25, 1997 was also used. The basic information from these sources was entered into Table 11. This table shows the number of transponders active at any time, the transponder bandwidth and the resulting spectrum available from the satellite.

The PanAmSat satellite at 103 WL could be in either of two configurations. This location was originally assigned to AT&T's Ka-band satellite. AT&T abandoned the system, the slot. A PanAmSat satellite originally assigned to 67 WL was reassigned by

[16] These amounts are the sum of the satellite, launch and insurance costs.

[17] Being acquired by EchoStar, even if the merger with DirecTV does not take place.

the FCC to 103 WL. The FCC file numbers are "180-SAT-P/L-95 thru 181-SAT-P/LA-95 for PanAmSat Corporation." The actual filing was made by Hughes Communications as part of its SPACEWAY series and bears a Mellon date of September 29, 1995. This was the due date for the first round of FCC filings for the Ka-band. The detail on file for the original (67 WL) location only contains "wide area" beams (about 3.4-degree circles).[18] After the reassignment to 103 WL, only six of these beams would be needed to cover the 50 states (one is devoted to Hawaii). The September 1995 filing also shows "narrow spot beams" (about 1.2 degree circles)[19], but not at 67 WL. I overlaid a set of these beams on the US from 103 WL and counted 21 narrow spot beams needed to cover the 50 states (including one on Hawaii). The other alternative, and more likely approach considering the degree of overlapping ownership that has existed between Hughes Network Systems and PanAmSat, would be to simply build another SPACEWAY based on the December 21, 2001 Minor Modification. This would provide a common satellite design yielding economies of scale and the ability to do an eventual in-orbit spare for all three locations (99, 101 and 103 WL). I therefore opted for the common design for all three locations. Two (99 and 101 WL) are SPACEWAYs and one (103 WL) is for PanAmSat.

The two Celsat locations (83 and 121 WL) are shared with EchoStar. The Celsat Ka-band capacity has been requested as feeder links for the 2 GHz mobile satellite service (MSS). Considering the currently depressed state of MSS and the advances of terrestrial (cellular) mobile services, the more likely use of the Ka-band will be for point-to-point broadband services into the six spot beam cities. Celsat's 850 MHz of spectrum is outside the normal FSS Ka-band allocations (see Table 14). Therefore, at the 83 and 121 WL locations the combined Celsat and EchoStar allocations are 1850 MHz.

Using data from the commercial digital broadcasting service, I calculated the potential transmission capability expressed in Gigabits per second (Gbps) for consumer services. This is derived from the allocated spectrum[20] and is a theoretical number. In

[18] See Figure C-13a of the SPACEWAY filing.

[19] See Figure C-12a, for example.

[20] I assumed an effective conversion of 1.15 bits per Hertz (27.6 Mbps in 24 MHz). From this number, the guard bands (10%), various overhead functions (10%) and loading inefficiencies

the case of the SPACEWAY satellites, the minor modification filed on December 21, 2001 contained a statement that the per-satellite capacity is 10 Gpbs. (This is close to our calculation of 9.66 Gbps.) The number of downlink beams is also provided in Table 14. In the case of SPACEWAY, the 24 transponders are timed-shared among 122 individual beams by beam hopping.

To convert the theoretical capacity in Gbps into the number of subscribers, I used numbers that are based on measurements by Microsoft for their MSN Network. These indicate that 11% of the subscribers are on-line at the peak busy hour. The on-line subscribers are not continuously sending and receiving data. The experience from MSN indicates that only 12.5% of the users online are actually receiving data at any instant. The rest of the time is occupied by the transmission times, reading and analyzing the material, drinking coffee or doing other things.

The FCC defines "advanced services" as being capable of at transmitting at least 200 kbps in each direction. Multiplying the 200 kbps by 11% and then by 12.5% indicates an average busy hour demand of 2.75 kbps per subscriber. This number is used to calculate the peak hour column by dividing the capacity by the average bit rate. In the case of the two SPACEWAY satellites, each satellite is capable of supporting approximately 3.6 million subscribers simultaneously using the 10 Gpbs value provided in the FCC filing. The planned constellation of four satellites can support up to 14.5 million subscribers.

Using the more conventional bit rates of 384 kbps one way and 256 kbps in the other, the limiting speed is 384 kbps for an average per-subscriber demand of 5.28 kbps. The 10 Gbps of SPACEWAY capacity will support up to 1.9 million subscribers per satellite. The four-satellite fleet (two at each SPACEWAY location) will support 7.6 million subscribers at this rate.

Similar calculations were performed for the EchoStar, PanAmSat, VisionStar and Celsat satellites using the potential capacities calculated from the bandwidth. The total potential subscribers are 6.6 to 12.7 million for these satellites.

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must be deducted. This reduced the useful capacities by 30%. This is the quantity shown in the Potential Gbps column.

C. CONCLUSION.

Based on the foregoing, I conclude that Hughes can provide Ka-band broadband service to approximately 7.6 to 14.5 million subscribers from its existing assigned orbital locations, well above the alleged critical mass of 5 million subscribers.

Based on the foregoing, I conclude that EchoStar can provide Ka-band broadband service to approximately 6.6 to 12.7 million subscribers from its existing assigned orbital locations, well above the alleged critical mass of 5 million subscribers.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Dated this 2nd day of February, 2001.

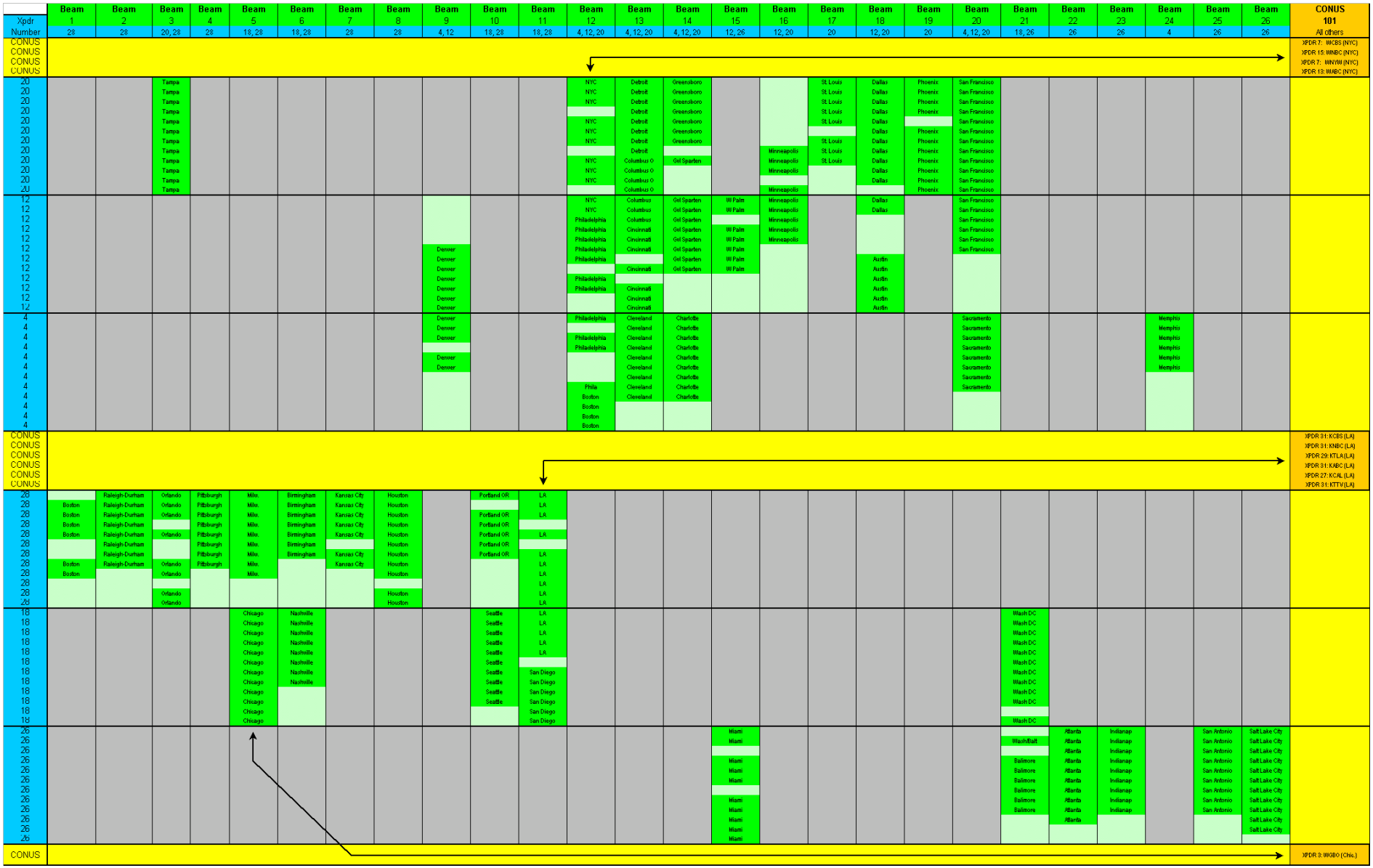
W L Morgan

Walter L. Morgan

TABLE 14 - ECHOSTAR & HUGHES BROADBAND KA-BAND SATELLITES WITH US COVERAGE

ECHOSTAR & HUGHES BROADBAND Ka-BAND SATELLITES WITH US COVERAGE																
Satellite Name	Operator	West	Downlink	Downlink	Uplink	Uplink	Transponders	Transponder	Satellite	Potential	Rated Capacity	Downlink	Beam size	Subscribers	
		Longitude	GHz	Spectrum	GHz	Spectrum	per satellite	MHz (each)	MHz	Gbps QPSK	Gbps per satellite	Beams	Degrees	Peak hour*	Peak hour*
			As requested	MHz	As requested	MHz								200 kbps	384 kbps
EchoStar **	EchoStar	83	18.3-18.8, 19.7-20.2	1000	28.35-28.6, 29.25-30.0	1000	48	120	5,760	4.64	Not indicated	24	1	1,686,109	878,182
Celsat East 83**	Celsat	83	17.7-18.55 **	850	27.5-28.35 **	850	6	850	5,100	4.11	Not indicated	6	0.6-0.7	1,492,909	777,557
Spaceway 99 (initial)	Hughes	99	19.7-20.2	500	29.5-30	500	24	500	12,000	9.66	10	122	0.5	3,636,364	1,893,939
Spaceway 99 (follow-on)	Hughes	99	18.3-18.8	500	28.35-28.6 & 29.25-29.5	500	24	500	12,000	9.66	10	122	0.5	3,636,364	1,893,939
Spaceway 101 (initial)	Hughes	101	19.7-20.2	500	29.5-30	500	24	500	12,000	9.66	10	122	0.5	3,636,364	1,893,939
Spaceway 101 (follow-on)	Hughes	101	18.3-18.8	500	28.35-28.6 & 29.25-29.5	500	24	500	12,000	9.66	10	122	0.5	3,636,364	1,893,939
PanAmSat (initial)	PAS	103	19.7-20.2	500	29.5-30	500	24	500	12,000	9.66	10	122	0.5	3,636,364	1,893,939
PanAmSat (future)	PAS	103	18.3-18.8	500	28.35-28.6 & 29.25-29.5	500	24	500	12,000	9.66	10	122	0.5	3,636,364	1,893,939
VisionStar	VisionStar	113	18.55-18.8, 19.45-20.2	1000	28.35-28.6, 29.25-30.0	1000	48	40	1,920	1.55	Not indicated	5	Varies	562,036	292,727
EchoStar IX (Ka) **	EchoStar	121	18.3-18.8, 19.7-20.2	1000	28.35-28.6, 29.25-30.0	1000	5	120	600	0.48	Not indicated	4 to 5	Conus?	175,636	91,477
Celsat West 121**	Celsat	121	17.7-18.55 **	850	27.5-28.35 **	850	6	850	5,100	4.11	Not indicated	6	0.6-0.7	1,492,909	777,557
* Peak busy hour using Microsoft MSN measurements.															
** Spectrum shared between Celsat (20% owned by EchoStar) and EchoStar. The															
are per Celsat's September 25, 1997 Amendment and EchoStar's February 22, 2000 Modification.														Totals	Totals
												DirecTV		14,545,455	7,575,758
												EchoStar		12,682,327	6,605,379

APPENDIX A - DIRECTV TRANSPONDER USAGES - JANUARY 2002



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APPENDIX B - DIRECTV-4S BEAMS

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
1	Maine (One frequency)	Boston (6), 19 Serves 12 of 19 Rest from a CONUS beam	Providence (49), 8 Portland-Auburn (79), 8 Bangor (155), 5 Presque Isle (205) 2
2	Eastern N.C. (One frequency)	Raleigh-Durham (29), 12	Norfolk-Portsmouth-Newport News (41), 8 Greenville-New Bern-Washington (106), 8 Florence-Myrtle Beach (114), 5 Wilmington (148), 4
3	Central Florida (Two frequencies)	Orlando-Daytona Beach-Melbourne (21), 15	Ft. Myers-Naples (81), 7 Gainesville (166), 4
4	Pittsburgh (One frequency)	Pittsburgh (20), 10	Cleveland (15), 14 Buffalo (44), 10 Rochester (74), 5 Johnstown-Altoona (95), 6 Youngstown (99), 4 Wheeling-Stubenville (140), 3 Erie (142), 5 Clarksburg-Weston (165), 4 Zanesville (202), 1
5	Lake Michigan (Two frequencies)	Milwaukee (33), 12 Chicago (see 23)	Grand Rapids-Kalamazoo-Battle Creek (38), 8 Green Bay-Appleton (69), 7 Madison (84), 6 South Bend-Elkhart (87), 5 Traverse City-Cadillac (119), 5 Rockford (135), 4
6	Huntsville (Two frequencies)	Nashville (31), 12 Birmingham (39), 10	Huntsville-Decatur (82), 8 Chattanooga (86), 8 Columbus-Tupelo-West Point (131), 4 Jackson, TN (184), 3
7	Kansas City (One frequency)	Kansas City (30), 9	Topeka (138), 4 Columbia-Jefferson City (143), 5 Joplin-Pittsburg (145), 4 St. Joseph (192), 2 Ottumwa-Kirksville (199), 2
8	Houston (One frequency)	Houston (11), 12 of 17 (rest on CONUS)	Waco-Temple-Bryan (94), 8 Tyler-Longview (108), 3 Victoria (204), 2
9	Denver Two frequencies)	Denver (18), 15 Colorado Springs - Pueblo (92), 5	Grand Junction - Montrose (186), 5 Cheyenne - Scottsbluff (198), 4
10	Seattle Two frequencies)	Seattle -Tacoma (12), 15 Portland (23), 9 of 10 (one on CONUS)	Eugene (122), 6 Yakima-Pasco-Richmond-Kennewick (125), 5 Medford-Klamath Falls (141), 6 Bend (200), 2
11	Los Angeles (Two frequencies)	Los Angeles (2), 23 San Diego (25), 8	Las Vegas (Part) (51), 9 Fresno-Visalia (Part) (54), 12 Bakersfield (130), 4

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
			Palm Springs (159), 2 Yuma-El Centro (174), 4
12	New York City (Three frequencies)	NYC (1), 22 (17 + 5 CONUS) Philadelphia (4), 18 Boston (6), 19	Hartford-New Haven (27), 9 Albany-Schenectady-Troy (56), 7 Burlington-Plattsburg (91), 8 Springfield-Holyoke (105), 3
13	Toledo (Three frequencies)	Cleveland (15), 14 Detroit (9), 9 Cincinnati (32), 9 Columbus (34), 7 (3 to CONUS)	Dayton (55), 7 Toledo (67), 6 Youngstown (99), 4 Ft. Wayne (104), 6 Lansing (107), 6 Wheeling-Stubenville (140), 3 Erie (142), 5 Parkersburg (185), 1 Lima (201), 3 Zanesville (202), 1
14	South Carolina (Three frequencies)	Charlotte (28), 12 Greenville-Spartanburg-Ashville-Anderson (35), 11 Greensboro-High Point-Winston Salem (47), 9	Richmond-Petersburg (60), 7 (at edge) Columbia (85), 7 Tri-Cities TN, VA (93), 7 Charleston (103), 6 Augusta (113), 6
15	South Florida (Two frequencies)	Miami-Ft. Lauderdale (16), 15 W. Palm Beach-Ft. Pierce (43), 10	Tampa-St. Pete-Sarasota (14), 13 Ft. Meyers-Naples (81), 7
16	Minneapolis (Two frequencies)	Minneapolis-St. Paul (13), 13 Des Moines-Ames (70), 7	Omaha (75), 7 Cedar Rapids-Waterloo-Dubuque (89), 7 Sioux Falls-Mitchell (111), 8 La Crosse-Eau Claire (126), 5 Duluth-Superior (132), 5 Wauselu-Reinlander (136), 5 Rochester-Mason City-Austin (152), 6 Makato (195), 1
17	St. Louis (One frequency)	St. Louis (22), 9	Paducah-Cape Girardeau-Harrisburg-Mt. Vernon (73), 9 Springfield (78), 6 Champaign & Springfield-Decatur (83), 8 Peoria-Bloomington (112), 6 Columbia-Jefferson City (143), 5 Quincy-Hanibal-Keokuk (163), 4 Jonesboro (180), 3
18	Dallas (Two frequencies)	Dallas-Ft. Worth (7), 18 Austin (58), 6	Waco-Temple-Bryan (94), 8 Tyler-Longview (108), 3 Wichita Falls & Lawton (146), 4
19	Phoenix (One to two frequencies[1])	Phoenix (17), 12	Tuscon (71), 8 Las Vegas (partial DMA coverage) (51), 9 Yuma-El Centro (174), 4
20	Northern California (Three frequencies)	San Francisco-Oakland-San Jose (5), 21 Sacramento-Stockton-Medesto (19), 11	Fresno-Visalia (54), 12 Reno (109), 7 (Partial coverage) Monterey-Salinas (118), 5 Chico-Redding (133), 5 Medford-Klamath Falls (141), 6
21	Allentown, PA	Washington-Hagerstown (8), 15	Philadelphia (4), 18

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
	(Two frequencies)	Baltimore (24), 7	Harrisburg-Lancaster-Lebanon-York (46), 7 Wilkes-Barre-Scranton (52), 7 Albany-Schenectady-Troy (56), 7 Richmond-Petersburg (60), 7 (Edge) Rochester (74), 5 Syracuse (80), 7 Burlington-Plattsburg (91), 8 Johnstown-Altoona (95), 6 Salisbury (162), 4 Utica (168), 3 Elmira (171), 3 Watertown (176), 3 Harrisonburg (179), 3 Charlottesville (193), 2
22	S.W. Georgia (One frequency)	Atlanta (10), 13	Savannah (100), 7 Tallahassee-Thomasville (110), 5 Augusta (113), 6 Montgomery (116), 7 Macon (121), 6 Columbus (128), 6 Albany (150), 6 Panama City (158), 5 Dothan (172), 3 Great Falls (187), 3
23	Chicago (One frequency)	Indianapolis (26), 13	Chicago (3), 16 Two are on CONUS (UNIVISION & WGN) Detroit (9), 9 Cincinnati (32), 9 Milwaukee (33), 12 Columbus (34), 7 Grand Rapids-Kalamazoo-Battle Creek (38), 8 Dayton (55), 7 Flint-Saghnaw-Bay City (64), 8 Toledo (67), 6 Green Bay-Appleton (69), 7 Champaign & Springfield-Decatur (83), 8 Madison (84), 6 South Bend-Elkhart (87), 5 Davenport-Rock Island-Muline (90), 6 Ft. Wayne (104), 6 Lansing (107), 6 Peoria-Bloomington (112), 6 Traverse City-Cadillac (119), 5 Rockford (135), 4 Wausau-Rhinelander (136), 5 Terre Haute (139), 5 Marquette (177), 4 Lafayette (194), 1 Lima (201), 3 Alpena (208), 2
24	Little Rock	Memphis (40), 9	Little Rock-Pine Bluff (57), 11

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
	(One Frequency)		**Paducah-Cape Girardeau-Harrisburg-Mt. Vernon (73), 9** **Shreveport (76), 7** **Jackson, MS (88), 5** **Ft. Smith-Fayetteville-Springdale-Rogers (115), 5** **Columbus-Tupelo-West Point (131), 4** **Monroe-El Dorado (134), 6** **Alexandria (178), 4** **Greenwood-Greenville (182), 3** **Meridian (183), 4** **Jackson, TN (184), 3**
25	**San Antonio (One frequency)**	**San Antonio (37), 13**	**Waco-Temple-Bryan (94), 8** **Corpus Christi (129), 5** **Laredo (189), 4** **San Angelo (196), 3** **Victoria (204), 2**
26	**Salt Lake City (One frequency)**	**Salt Lake City (36), 13**	**Idaho Falls-Pocatello (partial DMA coverage) (164), 5** **Grand Junction-Montrose (186), 5** **Twin falls (188), 3**

APPENDIX C - DIRECTV-7S BEAMS

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
1	Maine (One frequency)	Portland-Auburn (79), 8 Albany-Schenectady-Troy (56), 7	Boston (6), 19 Hartford & New Haven (27), 9 Providence-New Bedford (49), 8 Burlington-Plattsburg (91), 8 Springfield-Holyoke, MA (105), 3 Bangor (155), 5 Presque Isle (205), 2
2A	Hawaii (One frequency)	Honolulu (72), 12	
4	Pittsburgh (One frequency)	Johnstown-Altoona (95), 6 Buffalo (44), 10	Cleveland (15), 14 Pittsburg (20), 10 Toledo (67), 6 Rochester (74), 5 Youngstown (99), 4 Wheeling-Stubenville (140), 3 Erie (142) 5 Clarksburg-Weston (165), 4 Parkersburg (185), 1 Lima (201), 3 Zanesville (202), 1
5	Lake Michigan (Two frequencies)	South Bend-Elkhart (87), 5 Madison (84), 6 Green Bay-Appleton (69), 7 Grand Rapids-Kalamazoo-Battle Creek (38), 8	Chicago (3), 16 Milwaukee (33), 12 Traverse City-Cadillac (119), 5 Rockford (135), 4 Marquette (177), 4
6	Huntsville (Two frequencies)	Chattanooga (86), 8 Huntsville-Decatur-Florence (82), 8 Knoxville (63), 9	Minneapolis-St. Paul (13), 13 Nashville (31), 12 Birmingham (39), 10 Columbus-Tupelo-West Point (131), 4 Meridian (183), 4 Jackson, TN (184), 3
7	Kansas City (One frequency)	Cedar Rapids-Waterloo-Dubuque (89), 7 Springfield, MO (78), 6	Kansas City (30), 9 Topeka (138), 4 Columbia-Jefferson City (143), 5 Joplin-Pittsburg (145), 4 Quincy-Hannibal-Keokuk (163), 4 St. Joseph (192), 2 Ottumwa-Kirksville (199), 2
10A	Spokane (One frequency)	Spokane (77), 9	Yakima-Pasco-Richmond-Kennewick (125), 5
11A	Las Vegas (Two frequencies)	San Diego (25), 8 Las Vegas (51), 9	Phoenix (17), 12 Palm Springs (159), 2 Yuma-El Centro (174), 4
12	New York City (Three frequencies)	Boston (6), 19 New York (1), 22 Wilkes Barre-Scranton (52), 7 Providence-New Bedford (49), 8 Hartford & New Haven (27), 9	Albany-Schenectady-Troy (56), 7 Burlington-Plattsburg (91), 8 Springfield-Holyoke, MA (105), 3 Philadelphia (4), 18 Harrisburg-Lancaster-Lebanon-York (46), 7 Salisbury (162), 4 Harrisonburg (179), 3 Charlottesville (193), 2

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
13	**Toledo (Three frequencies)**	**Cleveland (15), 14 Youngstown (99), 4 Rochester, NY (74), 5 Toledo (67), 6 Dayton (55), 7 Louisville (48), 10**	**Wheeling-Stubenville (140), 3 Erie (142), 5 Lima (201), 3 Zanesville (202), 1 Detroit (9), 9 Indianapolis (26), 13 Cincinnati (32), 9 Columbus, OH (34), 7 Fort Wayne (104), 6 Lansing (107), 6**
14	**South Carolina (Three frequencies)**	**Atlanta (10), 13 Richmond-Petersburg (60), 7 Roanoke-Lynchburg (68), 7 Columbia, SC (85), 7 Tri Cities, TN (93), 7**	**Charlotte (28), 12 Raleigh-Durham (29), 12 Greenville-Spartenburg-Ashville-Anderson (35), 11 Greensboro-High Point-Winston Salem (47), 9 Charleston, SC (103), 6 Augusta (113), 6**
15	**South Florida (One frequency)**	**Tampa-St. Petersburg-Sarasota (14), 13 Miami-Fort Lauderdale (16), 15 Fort Meyers-Naples (81), 7**	**West Palm Beach-Fort Pierce (43), 10**
16	**Minneapolis (One frequency)**	**Des Moines-Ames (70), 7**	**Minneapolis-St. Paul (13), 13 Marquette (177), 4 Sioux Falls-Mitchell (111), 8 La Crosse-Eau Claire (126), 5 Duluth-Superior (132), 5 Wauselu-Reinlander (136), 5 Rochester-mason City-Austin (152), 6 Mankato (195), 1**
17	**St. Louis (One frequency)**	**Champaign-Smithfield-Decater (83), 8 Paducah-Cape Girardeau-Harrisburg-Mt. Vernon (73), 9**	**Springfield, MO (78), 6 Columbia-Jefferson City (143), 5 Joplin-Pittsburg (145), 4 Quincy-Hannibal-Keokuk (163), 4 Ottumwa-Kirksville (199), 2 Saint Louis (22), 9 Peoria-Bloomington (112), 6 Terre Haute (139), 5 Jonesboro (180), 3**
18	**Dallas (One frequency)**	**Walco-Temple-Bryan (94), 8**	**Dallas-Ft. Worth (7), 18 Austin (58), 6**
19A	**Alaska (One frequency)**	**Fairbanks (203), 5**	
20A	**Central California (Two frequencies)**	**Reno (109), 7 Fresno-Visilia (54), 12**	**San Francisco-Oakland-San Jose (5), 21 Sacramento-Stockton-Modesto (19), 11 Santa Barbara-Santa Maria-San Louis Obispo (117), 5 Monterey-Salinas (118), 5 Bakersfield (130), 4 Chico-Redding (133), 5**
21	**Allentown (Two frequencies)**	**Johnstown-Altoona (95), 6 Harrisburg-Lancaster-Lebanon-York (46), 7 Syracuse (80), 7 Burlington-Plattsburg (91), 8**	**Richmond-Petersburg (60), 7 Rochester, NY (74), 5 Wheeling-Stubenville (140), 3 Zanesville (202), 1 Wilkes Barre-Scranton (52), 7 Albany-Schenectady-Troy (56), 7**

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
			Philadelphia (4), 18 **Salisbury (162), 4** **Harrisonburg (179), 3** **Charlottesville (193), 2** **Clarksburg-Weston (165), 4** **Parkersburg (185), 1** **Washington, DC (8), 15** **Baltimore (24), 7** **Utica (168), 3** **Elmira (171), 3** **Watertown (176), 3**
22	**S.W. Georgia** **(One frequency)**	**Savannah (100), 7**	**Atlanta (10), 13** **Charlotte (28), 12** **Charleston, SC (103), 6** **Augusta (113), 6** **Jacksonville-Brunswick (53), 10** **Tallahassee-Thomasville (110), 5** **Montgomery (116), 7** **Macon (121), 6** **Columbus, GA (128), 6** **Albany, GA (150), 6** **Panama City (158), 5** **Dothan (172), 3**
23	**Chicago** **(One frequency)**	**Detroit (9), 9** **Indianapolis (26), 13** **Chicago (3), 16** **Flint-Saginaw-Bay City (64), 8**	**Champaign-Smithfield-Decater (83), 8** **Peoria-Bloomington (112), 6** **Terre Haute (139), 5** **Toledo (67), 6** **Lima (201), 3** **Cincinnati (32), 9** **Columbus, OH (34), 7** **Fort Wayne (104), 6** **Lansing (107), 6** **South Bend-Elkhart (87), 5** **Madison (84), 6** **Green Bay-Appleton (69), 7** **Grand Rapids-Kalamazoo-Battle Creek (38), 8** **Milwaukee (33), 12** **Rockford (135), 4** **Davenport-Rock Island-Moline (90), 6** **Lafayette, IN (194), 1** **Alpena (208), 2**
24A	**Louisiana** **(One frequency)**	**Shreveport (76), 7** **Little Rock-Pine Bluff (57), 11**	**Montgomery (116), 7** **Huntsville-Decatur-Florence (82), 8** **Columbus-Tupelo-West Point (131), 4** **Meridian (183), 4** **Jackson, TN (184), 3** **Memphis (40), 9** **New Orleans (42), 10** **Mobile-Pensacola (62), 11** **Jackson, MS (88), 5** **Baton Rouge (96), 5** **Monroe-El Dorado (134), 6** **Biloxi-Gulfport (157), 3** **Hattesburg-Laurel (167), 2**

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
			Lake Charles (173), 3 Alexander, LA (178), 4 Greenwood-Greenville (182), 3
33	North Florida (One frequency)	Jacksonville-Brunswick (53), 10	Gainesville (166), 4
39	Albuquerque (Two frequencies)	El Paso (98), 11 Albuquerque-Santa Fe (50), 15	
56	Tuscon (One frequency)	Tucson (71), 8	
57	Oklahoma (One frequency)	Oklahoma City (45), 10	Sherman-Ada (161), 2 Tulsa (59), 12 Wichita-Hutchinson (65), 10
58	Central Texas (One frequency)	Tyler-Longview (108), 3	Waco-Temple-Bryan (94), 8 Wichita Falls-Lawton (146), 4 Lubbock (147), 7 Odessa-Midland (151), 6 Abiline-Sweetwater (160), 4 Sherman-Ada (161), 2
59	Puerto Rico (One frequency)	Puerto Rico, 12	

APPENDIX D - ECHOSTAR LOCAL CHANNELS

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
ALBUQUERQUE	ABC-KOAT	Ch.7	KOAT	8810	110
ALBUQUERQUE	CBS-KRQE	Ch.13	KRQE	8811	110
ALBUQUERQUE	NBC-KOB	Ch.4	KOB	8812	110
ALBUQUERQUE	FOX-KASA	Ch.2	KASA	8813	110
ALBUQUERQUE	WB-KWBQ	Ch.19	KWBQ	8814	110
ALBUQUERQUE	UPN-KASY	Ch.50	KASY	8815	110
ALBUQUERQUE	PBS-KNME	Ch.5	KNME	8816	110
ALBUQUERQUE	IND-KAZQ,	Ch.32	KAZQ	8817	148
ALBUQUERQUE	UNVSN-KLUZ,	Ch.41	KLUZ	8818	148
ALBUQUERQUE	IND-KCHF,	Ch.11	KCHF	8822	148
ATLANTA	ABC-WSB,	Ch.2	WSB	8300	110
ATLANTA	CBS-WGCL,	Ch.46	WGCL	8301	110
ATLANTA	NBC-WXIA,	Ch.11	WXIA	8302	110
ATLANTA	FOX-WAGA,	Ch.5	WAGA	8303	110
ATLANTA	WB-WATL,	Ch.36	WATL	8304	110
ATLANTA	UPN-WUPA,	Ch.69	WUPA	8305	110
ATLANTA	PBS-WGTV,	Ch.8	WGTV	8306	110
ATLANTA	PBS-WPBA,	Ch.30	WPBA	8310	61.5
AUSTIN	ABC-KVUE,	Ch.24	KVUE	8250	110
AUSTIN	CBS-KEYE,	Ch.42	KEYE	8251	110
AUSTIN	NBC-KXAN,	Ch.36	KXAN	8252	110
AUSTIN	FOX-KTBC,	Ch.7	KTBC	8253	110
AUSTIN	WB-KNVA,	Ch.54	KNVA	8254	110
AUSTIN	PBS-KLRU,	Ch.18	KLRU	8256	110
BIRMINGHAM	ABC-WJSU,	Ch.40	WJSU	8050	110
BIRMINGHAM	CBS-WIAT,	Ch.42	WIAT	8051	110
BIRMINGHAM	NBC-WVTM,	Ch.13	WVTM	8052	110
BIRMINGHAM	FOX-WBRC,	Ch.6	WBRC	8053	110
BIRMINGHAM	WB-WTTO,	Ch.21	WTTO	8054	110
BIRMINGHAM	UPN-WABM,	Ch.68	WABM	8055	110
BIRMINGHAM	PBS-WBIQ,	Ch.10	WBIQ	8056	110
BOSTON	ABC-WCVB,	Ch.5	WCVB	8770	110
BOSTON	CBS-WBZ,	Ch.4	WBZ	8771	110
BOSTON	NBC-WHDH,	Ch.7	WHDH	8772	110
BOSTON	FOX-WFXT,	Ch.25	WFXT	8773	110
BOSTON	WB-WLVI,	Ch.56	WLVI	8774	110
BOSTON	UPN-WSBK,	Ch.38	WSBK	8775	119
BOSTON	PBS-WGBH,	Ch.2	WGBH	8776	110
BOSTON	IND-WNDS,	Ch.50	WNDS	8777	61.5
BOSTON	UNVSN-WUNI,	Ch.27	WUNI	8778	61.5
BOSTON	HSN-WFUB,	Ch.66	WFUB	8780	61.5
BOSTON	PBS-WGBX,	Ch.44	WGBX	8782	61.5

APPENDIX D (Cont'd)

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
CBSHD-LA			CBSHD	9454	148
CHARLOTTE	ABC-WSOC,	Ch.9	WSOC	8650	119
CHARLOTTE	CBS-WBTV,	Ch.3	WBTV	8651	119
CHARLOTTE	NBC-WCNC,	Ch.36	WCNC	8652	119
CHARLOTTE	FOX-WCCB,	Ch.18	WCCB	8653	119
CHARLOTTE	WB-WWWB,	Ch.55	WWWB	8654	119
CHARLOTTE	UPN-WJZY,	Ch.46	WJZY	8655	119
CHARLOTTE	PBS-WTVI,	Ch.42	WTVI	8656	61.5
CHARLOTTE	IND-WAXN,	Ch.64	WAXN	8657	61.5
CHARLOTTE	PBS-WNSC,	Ch.30	WNSC	8661	61.5
CHARLOTTE	PBS-WUNC,	Ch.4	WUNC	8662	119
CHICAGO	ABC-WLS,	Ch.7	WLS	8490	110
CHICAGO	CBS-WBBM,	Ch.2	WBBM	8491	110
CHICAGO	NBC-WMAQ,	Ch.5	WMAQ	8492	110
CHICAGO	FOX-WFLD,	Ch.32	WFLD	8493	110
CHICAGO	WB-WGN9,	Ch.9	WGN9	8494	110
CHICAGO	UPN-WPWR,	Ch.50	WPWR	8495	110
CHICAGO	PBS-WTTW,	Ch.11	WTTW	8496	110
CHICAGO	UNVSN-WGBO,	Ch.66	WGBO	8498	61.5
CHICAGO	TMNDO-WSNS,	Ch.44	WSNS	8499	61.5
CHICAGO	HSN-WXFT,	Ch.60	WXFT	8500	61.5
CHICAGO	PBS-WYCC,	Ch.20	WYCC	8501	61.5
CHICAGO	IND-WJYS,	Ch.62	WJYS	8503	61.5
CINCINNATI	ABC-WCPO,	Ch.9	WCPO	8350	110
CINCINNATI	CBS-WKRC,	Ch.12	WKRC	8351	110
CINCINNATI	NBC-WLWT,	Ch.5	WLWT	8352	110
CINCINNATI	FOX-WXIX,	Ch.19	WXIX	8353	110
CINCINNATI	WB-WSTR,	Ch.64	WSTR	8354	110
CINCINNATI	PBS-WCET,	Ch.48	WCET	8356	110
CLEVELAND	ABC-WEWS,	Ch.5	WEWS	8510	110
CLEVELAND	CBS-WOIO,	Ch.19	WOIO	8511	110
CLEVELAND	NBC-WKYC,	Ch.3	WKYC	8512	110
CLEVELAND	FOX-WJW,	Ch.8	WJW	8513	110
CLEVELAND	WB-WBNX,	Ch.55	WBNX	8514	110
CLEVELAND	UPN-WUAB,	Ch.43	WUAB	8515	110
CLEVELAND	PBS-WVIZ,	Ch.25	WVIZ	8516	110
CLEVELAND	HSN-WQHS,	Ch.61	WQHS	8521	61.5
DALLAS	ABC-WFAA,	Ch.8	WFAA	8400	110
DALLAS	CBS-KTVT,	Ch.11	KTVT	8401	110
DALLAS	NBC-KXAS,	Ch.5	KXAS	8402	110
DALLAS	FOX-KDFW,	Ch.4	KDFW	8403	110
DALLAS	WB-KDAF,	Ch.33	KDAF	8404	110
DALLAS	UPN-KTXA,	Ch.21	KTXA	8405	110
DALLAS	PBS-KDTN,	Ch.2	KDTN	8406	110
DALLAS	IND-KDFI,	Ch.27	KDFI	8407	110
DALLAS	UNVSN-KUVN,	Ch.23	KUVN	8408	148
DALLAS	TMNDO-KFWD,	Ch.52	KFWD	8409	148
DALLAS	IND-KSTR,	Ch.49	KSTR	8410	148
DALLAS	IND-KXTX,	Ch.39	KXTX	8411	148
DALLAS	IND-KMPX,	Ch.29	KMPX	8413	148
DALLAS	PBS-KERA,	Ch.13	KERA	8415	148

APPENDIX D (Cont'd)

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
DENVER	ABC-KMGH,	Ch.7	KMGH	8200	110
DENVER	CBS-KCNC,	Ch.4	KCNC	8201	110
DENVER	NBC-KUSA,	Ch.9	KUSA	8202	110
DENVER	FOX-KDVR,	Ch.31	KDVR	8203	110
DENVER	WB-KWGN,	Ch.2	KWGN	8204	119
DENVER	UPN-KTVD,	Ch.20	KTVD	8205	110
DENVER	PBS-KRMA,	Ch.6	KRMA	8206	110
DENVER	IND-KRMT,	Ch.41	KRMT	8207	148
DENVER	UNVSN-KCEC,	Ch.50	KCEC	8208	148
DENVER	TMNDO-KMAS,	Ch.24	KMAS	8209	148
DENVER	IND-KWHD,	Ch.53	KWHD	8210	148
DENVER	PBS-KBDI,	Ch.12	KBDI	8211	148
DENVER	HSN-KTVJ,	Ch.14	KTVJ	8212	148
DENVER	IND-KDEN,	Ch.25	KDEN	8213	148
DETROIT	ABC-WXYZ,	Ch.7	WXYZ	8030	110
DETROIT	CBS-WWJ,	Ch.62	WWJ	8031	110
DETROIT	NBC-WDIV,	Ch.4	WDIV	8032	110
DETROIT	FOX-WJBK,	Ch.2	WJBK	8033	110
DETROIT	WB-WDWB,	Ch.20	WDWB	8034	110
DETROIT	UPN-WKBD,	Ch.50	WKBD	8035	110
DETROIT	PBS-WTVS,	Ch.56	WTVS	8036	110
DETROIT	IND-WADL,	Ch.38	WADL	8037	61.5
GREENVILLE	ABC-WLOS,	Ch.13	WLOS	8180	119
GREENVILLE	CBS-WSPA,	Ch.7	WSPA	8181	119
GREENVILLE	NBC-WYFF,	Ch.4	WYFF	8182	119
GREENVILLE	FOX-WHNS,	Ch.21	WHNS	8183	119
GREENVILLE	WB-WBSC,	Ch.40	WBSC	8184	119
GREENVILLE	UPN-WASV,	Ch.62	WASV	8185	119
GREENVILLE	PBS-WNTV,	Ch.29	WNTV	8186	61.5
GREENVILLE	PBS-WUNC,	Ch.4	WUNC	8190	119
GREENVILLE	IND-WGGS,	Ch.16	WGGS	8192	61.5
HOUSTON	ABC-KTRK,	Ch.13	KTRK	8370	110
HOUSTON	CBS-KHOU,	Ch.11	KHOU	8371	110
HOUSTON	NBC-KPRC,	Ch.2	KPRC	8372	110
HOUSTON	FOX-KRIV,	Ch.26	KRIV	8373	110
HOUSTON	WB-KHWB,	Ch.39	KHWB	8374	110
HOUSTON	UPN-KTXH,	Ch.20	KTXH	8375	110
HOUSTON	PBS-KUHT,	Ch.8	KUHT	8376	110
HOUSTON	UNVSN-KXLN,	Ch.45	KXLN	8378	148
HOUSTON	TMNDO-KTMD,	Ch.48	KTMD	8379	148
HOUSTON	HSN-KFTH,	Ch.67	KFTH	8380	148
HOUSTON	IND-KTBU,	Ch.55	KTBU	8382	148
HOUSTON	IND-KZJL,	Ch.61	KZJL	8384	148
INDIANAPOLIS	ABC-WRTV,	Ch.6	WRTV	8450	110
INDIANAPOLIS	CBS-WISH,	Ch.8	WISH	8451	110
INDIANAPOLIS	NBC-WTHR,	Ch.13	WTHR	8452	110
INDIANAPOLIS	FOX-WXIN,	Ch.59	WXIN	8453	110
INDIANAPOLIS	UPN-WNDY,	Ch.23	WNDY	8455	110
INDIANAPOLIS	PBS-WFYI,	Ch.20	WFYI	8456	110
INDIANAPOLIS	IND-WHMB,	Ch.40	WHMB	8457	61.5
INDIANAPOLIS	PBS-WTBU,	Ch.69	WTBU	8460	61.5

APPENDIX D (Cont'd)

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
KANSAS CITY	ABC-KMBC,	Ch.9	KMBC	8430	110
KANSAS CITY	CBS-KCTV,	Ch.5	KCTV	8431	110
KANSAS CITY	NBC-KSHB,	Ch.41	KSHB	8432	110
KANSAS CITY	FOX-WDAF,	Ch.4	WDAF	8433	110
KANSAS CITY	WB-KSMO,	Ch.62	KSMO	8434	110
KANSAS CITY	UPN-KCWE,	Ch.29	KCWE	8435	110
KANSAS CITY	PBS-KCPT,	Ch.19	KCPT	8436	110
KANSAS CITY	IND-KMCI,	Ch.38	KMCI	8437	148
LOS ANGELES	ABC-KABC,	Ch.7	KABC	8000	119
LOS ANGELES	CBS-KCBS,	Ch.2	CBS-W	8001	119
LOS ANGELES	NBC-KNBC,	Ch.4	KNBC	8002	119
LOS ANGELES	FOX-KTTV,	Ch.11	KTTV	8003	119
LOS ANGELES	WB-KTLA,	Ch.5	KTLA	8004	119
LOS ANGELES	UPN-KCOP,	Ch.13	KCOP	8005	119
LOS ANGELES	PBS-KCET,	Ch.28	KCET	8006	119
LOS ANGELES	IND-KCAL,	Ch.9	KCAL	8007	119
LOS ANGELES	UNVSN-KMEX,	Ch.34	KMEX	8008	119
LOS ANGELES	Telemundo,	Ch.52	KVEA	8009	148
LOS ANGELES	Home Shopping Network	Ch.46	KFTR	8010	148
LOS ANGELES	TV Azteca	Ch.54	KAZA	8011	148
LOS ANGELES	Public Broadcasting	Ch.58	KLCS	8012	148
LOS ANGELES	Public Broadcasting	Ch.50	KOCE	8013	148
LOS ANGELES	UPN	Ch.63	KADY	8015	148
LOS ANGELES	Independent,	Ch.62	KRCA	8016	148
LOS ANGELES	Independent,	Ch.18	KSCI	8017	148
LOS ANGELES	Independent,	Ch.56	KDOC	8018	148
LOS ANGELES	Independent,	Ch.44	KXLA	8020	148
LOS ANGELES	Independent,	Ch.31	KVMD	8021	148
LOS ANGELES	Independent,	Ch.57	KJLA	8022	148
LOS ANGELES	Spanish Independent,	Ch.22	KWHY	8023	148
MIAMI	ABC-WPLG,	Ch.10	WPLG	8830	110
MIAMI	CBS-WFOR,	Ch.4	WFOR	8831	110
MIAMI	NBC-WTVJ,	Ch.6	WTVJ	8832	110
MIAMI	FOX-WSVN,	Ch.7	WSVN	8833	110
MIAMI	WB-WBZL,	Ch.39	WBZL	8834	110
MIAMI	UPN-WBFS,	Ch.33	WBFS	8835	110
MIAMI	PBS-WPBT,	Ch.2	WPBT	8836	110
MIAMI	UNVSN-WLTV,	Ch.23	WLTV	8838	110
MIAMI	TMNDO-WSCV,	Ch.51	WSCV	8839	110
MIAMI	UNVSN-WAMI,	Ch.69	WAMI	8840	61.5
MIAMI	PBS-WLRN,	Ch.17	WLRN	8841	61.5
MIAMI	Spanish Independent,	Ch.22	WEYS	8842	61.5
MINNEAPOLIS	ABC-KSTP,	Ch.5	KSTP	8570	110
MINNEAPOLIS	CBS-WCCO,	Ch.4	WCCO	8571	110
MINNEAPOLIS	NBC-KARE,	Ch.11	KARE	8572	110
MINNEAPOLIS	FOX-WFTC,	Ch.29	WFTC	8573	110
MINNEAPOLIS	WB-KMWB,	Ch.23	KMWB	8574	110
MINNEAPOLIS	UPN-KMSP,	Ch.9	KMSP	8575	110
MINNEAPOLIS	PBS-KTCA,	Ch.2	KTCA	8576	110
MINNEAPOLIS	IND-KSTC,	Ch.45	KSTC	8577	61.5
MINNEAPOLIS	PBS-KTCI,	Ch.17	KTCI	8580	61.5

APPENDIX D (Cont'd)

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
NASHVILLE	ABC-WKRN,	Ch.2	WKRN	8550	110
NASHVILLE	CBS-WTVF,	Ch.5	WTVF	8551	110
NASHVILLE	NBC-WSMV,	Ch.4	WSMV	8552	110
NASHVILLE	FOX-WZTV,	Ch.17	WZTV	8553	110
NASHVILLE	WB-WNAB,	Ch.58	WNAB	8554	110
NASHVILLE	UPN-WUXP,	Ch.30	WUXP	8555	110
NASHVILLE	PBS-WNPT,	Ch.8	WNPT	8556	110
NASHVILLE	IND-WHTN,	Ch.39	WHTN	8557	61.5
NASHVILLE	IND-WJFB,	Ch.66	WJFB	8560	61.5
NEW YORK	ABC-WABC,	Ch.7	WABC	8100	119
NEW YORK	CBS-WCBS,	Ch.2	WCBS	8101	119
NEW YORK	NBC-WNBC,	Ch.4	WNBC	8102	119
NEW YORK	FOX-WNYW,	Ch.5	WNYW	8103	119
NEW YORK	WB-WPIX,	Ch.11	WPIX	8104	119
NEW YORK	UPN-WWOR,	Ch.9	WWOR	8105	119
NEW YORK	PBS-WNET,	Ch.13	WNET	8106	119
NEW YORK	IND-WLNY,	Ch.55	WLNY	8107	61.5
NEW YORK	UNVSN-WXTV,	Ch.41	WXTV	8108	119
NEW YORK	PBS-WLIW,	Ch.21	WLIW	8112	61.5
NEW YORK	PBS-WNYE,	Ch.25	WNYE	8114	61.5
NEW YORK	IND-WRNN,	Ch.62	WRNN	8116	61.5
NEW YORK	CBSHD-NY	CBSHD	CBSHD	9453	61.5
ORLANDO	ABC-WFTV,	Ch.9	WFTV	8270	110
ORLANDO	CBS-WKMG,	Ch.6	WKMG	8271	110
ORLANDO	NBC-WESH,	Ch.2	WESH	8272	110
ORLANDO	FOX-WOFL,	Ch.35	WOFL	8273	110
ORLANDO	UPN-WRBW,	Ch.65	WRBW	8275	110
ORLANDO	PBS-WMFE,	Ch.24	WMFE	8276	110
ORLANDO	IND-WRDQ,	Ch.27	WRDQ	8277	110
ORLANDO	HSN-WFUO,	Ch.43	WFUO	8280	61.5
ORLANDO	PBS-WBCC,	Ch.68	WBCC	8282	61.5
ORLANDO	IND-WTGL,	Ch.52	WTGL	8283	61.5
ORLANDO	IND-WACX,	Ch.55	WACX	8285	61.5
PHILADELPHIA	ABC-WPVI,	Ch.6	WPVI	8150	110
PHILADELPHIA	CBS-KYW,	Ch.3	KYW	8151	110
PHILADELPHIA	NBC-WCAU,	Ch.10	WCAU	8152	110
PHILADELPHIA	FOX-WTXF,	Ch.29	WTXF	8153	110
PHILADELPHIA	WB-WPHL,	Ch.17	WPHL	8154	110
PHILADELPHIA	UPN-WPSG,	Ch.57	WPSG	8155	110
PHILADELPHIA	PBS-WHYY,	Ch.12	WHYY	8156	110
PHILADELPHIA	UNVSN-WUVP,	Ch.65	WUVP	8158	129
PHILADELPHIA	PBS-WNJS,	Ch.23	WNJS	8161	129
PHILADELPHIA	PBS-WYBE,	Ch.35	WYBE	8162	129
PHILADELPHIA	IND-WFMZ,	Ch.69	WFMZ	8164	129
PHILADELPHIA	IND-WGTW,	Ch.48	WGTW	8166	129
PHOENIX	ABC-KNXV,	Ch.15	KNXV	8320	119
PHOENIX	CBS-KPHO,	Ch.5	KPHO	8321	119
PHOENIX	NBC-KPNX,	Ch.12	KPNX	8322	119
PHOENIX	FOX-KSAZ,	Ch.10	KSAZ	8323	119
PHOENIX	WB-KASW,	Ch.61	KASW	8324	119
PHOENIX	UPN-KUTP,	Ch.45	KUTP	8325	119
PHOENIX	PBS-KAET,	Ch.8	KAET	8326	119
PHOENIX	IND-KTVK,	Ch.3	KTVK	8327	119
PHOENIX	UNVSN-KTVW,	Ch.33	KTVW	8328	148
PHOENIX	IND-KDTP,	Ch.39	KDTP	8333	148
PHOENIX	IND-KPHZ,	Ch.11	KPHZ	8335	148

APPENDIX D (Cont'd)

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
PITTSBURGH	ABC-WTAE,	Ch.4	WTAE	8130	110
PITTSBURGH	CBS-KDKA,	Ch.2	KDKA	8131	110
PITTSBURGH	NBC-WPXI,	Ch.11	WPXI	8132	110
PITTSBURGH	FOX-WPGH,	Ch.53	WPGH	8133	110
PITTSBURGH	WB-WCWB,	Ch.22	WCWB	8134	110
PITTSBURGH	UPN-WNPA,	Ch.19	WNPA	8135	110
PITTSBURGH	PBS-WQED,	Ch.13	WQED	8136	110
PITTSBURGH	IND-WPCB,	Ch.40	WPCB	8137	61.5
PORTLAND	ABC-KATU,	Ch.2	KATU	8670	110
PORTLAND	CBS-KOIN,	Ch.6	KOIN	8671	110
PORTLAND	NBC-KGW,	Ch.8	KGW	8672	110
PORTLAND	FOX-KPDX,	Ch.49	KPDX	8673	110
PORTLAND	WB-KWBP,	Ch.32	KWBP	8674	110
PORTLAND	UPN-KPTV,	Ch.12	KPTV	8675	110
PORTLAND	PBS-KOPB,	Ch.10	KOPB	8676	110
RALEIGH-DURHAM	ABC-WTVD,	Ch.11	WTVD	8750	119
RALEIGH-DURHAM	CBS-WRAL,	Ch.5	WRAL	8751	119
RALEIGH-DURHAM	NBC-WNCN,	Ch.17	WNCN	8752	119
RALEIGH-DURHAM	FOX-WRAZ,	Ch.50	WRAZ	8753	119
RALEIGH-DURHAM	WB-WLFL,	Ch.22	WLFL	8754	119
RALEIGH-DURHAM	UPN-WRDC,	Ch.28	WRDC	8755	119
RALEIGH-DURHAM	PBS-WUNC,	Ch.4	WUNC	8756	119
RALEIGH-DURHAM	IND-WKFT,	Ch.40	WKFT	8757	61.5
SACRAMENTO	ABC-KXTV,	Ch.10	KXTV	8630	110
SACRAMENTO	CBS-KOVR,	Ch.13	KOVR	8631	110
SACRAMENTO	NBC-KCRA,	Ch.3	KCRA	8632	110
SACRAMENTO	FOX-KTXL,	Ch.40	KTXL	8633	110
SACRAMENTO	WB-KQCA,	Ch.58	KQCA	8634	110
SACRAMENTO	UPN-KMAX,	Ch.31	KMAX	8635	110
SACRAMENTO	PBS-KVIE,	Ch.6	KVIE	8636	110
SACRAMENTO	UNVSN-KUVS,	Ch.19	KUVS	8638	148
SALT LAKE CITY	ABC-KTVX,	Ch.4	KTVX	8530	110
SALT LAKE CITY	CBS-KUTV,	Ch.2	KUTV	8531	110
SALT LAKE CITY	NBC-KSL,	Ch.5	KSL	8532	110
SALT LAKE CITY	FOX-KSTU,	Ch.13	KSTU	8533	110
SALT LAKE CITY	WB-KUWB,	Ch.30	KUWB	8534	110
SALT LAKE CITY	UPN-KPNZ,	Ch.24	KPNZ	8535	110
SALT LAKE CITY	PBS-KUED,	Ch.7	KUED	8536	110
SALT LAKE CITY	KJZZ,	Ch.14	KJZZ	8537	110
SALT LAKE CITY	PBS-KBYU,	Ch.11	KBYU	8540	148
SALT LAKE CITY	PBS-KULC,	Ch.9	KULC	8541	148
SALT LAKE CITY	IND-KTMW,	Ch.20	KTMW	8542	148
SAN ANTONIO	ABC-KSAT,	Ch.12	KSAT	8470	110
SAN ANTONIO	CBS-KENS,	Ch.5	KENS	8471	110
SAN ANTONIO	NBC-KMOL,	Ch.4	KMOL	8472	110
SAN ANTONIO	FOX-KABB,	Ch.29	KABB	8473	110
SAN ANTONIO	WB-KRRT,	Ch.35	KRRT	8474	110
SAN ANTONIO	UPN-KBEJ,	Ch.2	KBEJ	8475	110
SAN ANTONIO	PBS-KLRN,	Ch.9	KLRN	8476	110
SAN ANTONIO	UNVSN-KWEX,	Ch.41	KWEX	8478	148
SAN ANTONIO	TMNDO-KVDA,	Ch.60	KVDA	8479	148
SAN DIEGO	ABC-KGTV,	Ch.10	KGTV	8790	110
SAN DIEGO	CBS-KFMB,	Ch.8	KFMB	8791	110
SAN DIEGO	NBC-KNSD,	Ch.39	KNSD	8792	110
SAN DIEGO	FOX-XETV,	Ch.6	XETV	8793	110
SAN DIEGO	WB-KSWB,	Ch.69	KSWB	8794	110
SAN DIEGO	PBS-KPBS,	Ch.15	KPBS	8796	110

APPENDIX D (Cont'd)

Market	Network	TV Ch#	CH Name	Sat Ch#	Sat Loc
SAN FRANCISCO	ABC-KGO,	Ch.7	KGO	8220	110
SAN FRANCISCO	CBS-KPIX,	Ch.5	KPIX	8221	110
SAN FRANCISCO	NBC-KNTV,	Ch.11	KNTV	8222	110
SAN FRANCISCO	FOX-KTVU,	Ch.2	KTVU	8223	110
SAN FRANCISCO	WB-KBWB,	Ch.20	KBWB	8224	110
SAN FRANCISCO	UPN-KBHK,	Ch.44	KBHK	8225	110
SAN FRANCISCO	PBS-KQED,	Ch.9	KQED	8226	110
SAN FRANCISCO	TMNDO-KSTS,	Ch.48	KSTS	8229	148
SAN FRANCISCO	HSN-KFSF,	Ch.66	KFSF	8230	148
SAN FRANCISCO	AZTECA-KTNC,	Ch.42	KTNC	8231	148
SAN FRANCISCO	PBS-KMTP,	Ch.32	KMTP	8232	148
SAN FRANCISCO	PBS-KRCB,	Ch.22	KRCB	8233	148
SAN FRANCISCO	PBS-KTEH,	Ch.54	KTEH	8234	148
SAN FRANCISCO	PBS-KCSM,	Ch.60	KCSM	8235	148
SAN FRANCISCO	IND-KTSF,	Ch.26	KTSF	8237	148
SEATTLE	ABC-KOMO,	Ch.4	KOMO	8610	110
SEATTLE	CBS-KIRO,	Ch.7	KIRO	8611	110
SEATTLE	NBC-KING,	Ch.5	KING	8612	110
SEATTLE	FOX-KCPQ,	Ch.13	KCPQ	8613	110
SEATTLE	WB-KTWB,	Ch.22	KTWB	8614	110
SEATTLE	UPN-KSTW,	Ch.11	KSTW	8615	110
SEATTLE	PBS-KCTS,	Ch.9	KCTS	8616	110
SEATTLE	IND-KONG,	Ch.16	KONG	8617	110
SEATTLE	PBS-KBTC,	Ch.28	KBTC	8620	148
SEATTLE	Independent,	Ch.24	KBCB	8621	148
SEATTLE	IND-KWDK,	Ch.56	KWDK	8622	148
SEATTLE	IND-KWOG,	Ch.51	KWOG	8624	148
ST. LOUIS	ABC-KDNL,	Ch.30	KDNL	8590	119
ST. LOUIS	CBS-KMOV,	Ch.4	KMOV	8591	119
ST. LOUIS	NBC-KSDK,	Ch.5	KSDK	8592	119
ST. LOUIS	FOX-KTVI,	Ch.2	KTVI	8593	119
ST. LOUIS	WB-KPLR,	Ch.11	KPLR	8594	119
ST. LOUIS	PBS-KETC,	Ch.9	KETC	8596	119
ST. LOUIS	IND-KNLC,	Ch.24	KNLC	8597	61.5
ST. LOUIS	HSN-WHSL,	Ch.46	WHSL	8601	61.5
TAMPA-ST. PETE	ABC-WFTS,	Ch.28	WFTS	8690	110
TAMPA-ST. PETE	CBS-WTSP,	Ch.10	WTSP	8691	110
TAMPA-ST. PETE	NBC-WFLA,	Ch.8	WFLA	8692	110
TAMPA-ST. PETE	FOX-WTVT,	Ch.13	WTVT	8693	110
TAMPA-ST. PETE	WB-WTTA,	Ch.38	WTTA	8694	110
TAMPA-ST. PETE	UPN-WTOG,	Ch.44	WTOG	8695	110
TAMPA-ST. PETE	PBS-WEDU,	Ch.3	WEDU	8696	110
WASHINGTON, DC	ABC-WJLA,	Ch.7	WJLA	8070	110
WASHINGTON, DC	CBS-WUSA,	Ch.9	WUSA	8071	110
WASHINGTON, DC	NBC-WRC,	Ch.4	WRC	8072	110
WASHINGTON, DC	FOX-WTTG,	Ch.5	WTTG	8073	110
WASHINGTON, DC	WB-WBDC,	Ch.50	WBDC	8074	110
WASHINGTON, DC	UPN-WDCA,	Ch.20	WDCA	8075	110
WASHINGTON, DC	PBS-WETA,	Ch.26	WETA	8076	110
WASHINGTON, DC	IND-WNVC,	Ch.56	WNVC	8077	61.5
WASHINGTON, DC	IND-WFDC,	Ch.14	WFDC	8080	61.5
WASHINGTON, DC	PBS-WHUT,	Ch.32	WHUT	8081	61.5
WASHINGTON, DC	IND-WNVT,	Ch.53	WNVT	8084	61.5

APPENDIX E - ECHOSTAR 7 BEAMS

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
3	Northwest (Two frequencies)	Seattle-Tacoma (12), 15	Portland, OR (23), 10 Yakima-Pasco-Richland-Kennewick (125), 5 Bend (200), 2
4	Northern California (Two frequencies)	San Francisco-Oakland-San Jose (5), 21	Sacramento-Stockton-Modesto (19), 11 [148] Fresno-Visalia (54), 12 Reno (109), 7 Monterey-Salinas (118), 5 Chico-Redding (133), 5 Eureka (191), 5
5	Southern California (Two frequencies)	Los Angeles (2), 19 + 4 on CONUS San Diego (25), 8 [148]	Santa Barbara-Santa Maria-San Louis Obispo (117), 4 Bakersfield (130), 4 Palm Springs (159), 2 Yuma-El Centro (174), 4
6	Phoenix (Two frequencies)	Phoenix (17), 12 Tuscon (71), 8 Yuma-El Centro (174), 4	
7	Salt Lake City (One frequency)	Salt Lake City (36), 13	Idaho Falls-Pocatello (164), 5 Twin Falls (188), 3
8	Mexico City, Mexico	(No U.S. DMAs)	
9	Kansas (Two frequencies)	Kansas City (30), 9 Oklahoma City (45), 10	Tulsa (59), 12 Topeka (138), 4 Columbia-Jefferson City (143), 5 Joplin-Pittsburgh (145), 4 St. Joseph (192), 2 Ottumawa-Kirksville (199), 2
10	Houston (Two frequencies)	Houston (11), 17 Austin (58), 6	Waco-Temple-Bryan (94), 8 San Antonio (37), 14 Corpus Christi (129), 5 Laredo (189), 4 Victoria (204), 2
11	Chicago (Two frequencies)	St. Louis (22), 9 Indianapolis (26), 13	Chicago (3), 16 [110] Milwaukee (33), 12 Grand Rapids-Kalamazoo-Battle Creek (38), 8 South Bend-Elkart (87), 5 Davenport-Rock Island-Moline (90), 6 Ft. Wayne (104), 6 Lansing (107), 6 Peoria-Bloomington (112), 6 Rockford (135), 4 Terre Haute (139), 5 Columbia-Jefferson City (143), 5 Quincy-Hannibal-Keokuk (163), 4 Lafayette (194), 1
12	Mississippi (One frequency)	Birmingham (39), 10	New Orleans (42), 10 Mobile-Pensacola (62), 11 Huntsville-Decatur (82), 8 Jackson (88), 5 Baton Rouge (96), 5 Montgomery (116), 7 Columbus-Tupelo-West Point (131), 4

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
			Biloxi-Gulfport (157), 3 **Hattisburg-Laurel (167), 2** **Meridian (183), 4**
13	**New York (Two frequencies)**	**New York (1), 18 + 4 on CONUS**	**Philadelphia (4), 18** **Boston (6), 19** **Washington DC (8), 15** **Baltimore (24), 7** **Hartford & New Haven (27), 9** **Harrisburg-Lancaster-York (46), 7** **Providence (49), 8** **Wilkes-Barne-Scranton (52), 7** **Albany-Schenectady-Troy (56), 7** **Portland-Auburn (79), 8** **Springfield-Holyoke (105), 3** **Binghamton (156), 4** **Charlottesville (193), 2**
14	**South Carolina (Two frequencies)**	**Atlanta (10), 9 + 4 on CONUS** **Charlotte (28), 12**	**Raleigh-Durham (29), 12** **Norfolk-Portsmouth-Newport News (41), 8** **Greensboro-High Point-Winston Salem (47), 9** **Albany (56), 7** **Columbia (85), 7** **Savannah (100), 7** **Charleston (103), 6** **Greenville-New Bern-Washington (106), 8** **Augusta (113), 6** **Florence-Myrtle Beach (114), 5** **Macon (121), 6** **Wilmington (NC) (148), 4**
15	**South Florida (Two frequencies)**	**Miami-Ft. Lauderdale (16), 15** **West Palm Beach-Ft. Pierce (43), 9 + 1 on 110 CONUS**	**Ft. Myers-Naples (81), 7 [61.5]**

APPENDIX F - ECHOSTAR 8 BEAMS

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
1A	East Coast A (Two frequencies)	Baltimore (24), 7 Hartford & New Haven (27), 9 Pittsburg (20), 10	New York (1), 22 Washington, DC (8), 15 Harrisburg-Lancaster-Lebanon-York (46), 7 Providence-New Bedford (49), 8 Wilkes Barre-Scranton (52), 7 Albany-Schenectady-Troy (56), 7 Portland-Auburn (79), 8 Syracuse (80), 7 Burlington-Plattsburg (91), 8 Johnstown-Altoona (95), 6 Springfield-Holyoke, MA (105), 3 Bangor (155), 5
3	Northwest (One frequency)	Portland, OR (23), 10 Sacramento-Stockton, Modesto (19), 11	Seattle-Tacoma (12), 15 Spokane (77), 9 Bend (200), 2
4	Northern California (Two frequencies)	Monterey-Salinas (118), 5 Reno (109), 7 Fresno-Visalia (54), 12	San Francisco-Oakland-San Jose (5), 21 Yakima-Pasco-Richmond-Kennewick (125), 5 Chico-Redding (133), 5 Eureka (191), 5
5	South California (One frequency)	El Paso (98), 11 San Diego (25), 8	Monterey-Salinas (118), 5 Santa Barbara-Santa Maria- San Louis Obispo (117), 5 Bakersfield (130), 4 Palm Springs (159), 2
9	Kansas (One frequency)	Tulsa (59), 12	Kansas City (30), 9 Oklahoma City (45), 10 Topeka (138), 4 Joplin-Pittsburg (145), 4 Sherman-Ada (161), 2 St. Joseph (192), 2
11	Chicago (Three frequencies)	Chicago (3), 16 South Bend-Elkhart (87), 5 Grand Rapids-Kalamazoo-Battle Creek (38), 8 Milwaukee (33), 12 Indianapolis (26), 13	Springfield-Holyoke, MA (105), 3 Flint-Saginaw-Bay City (64), 8 Cedar Rapids-Waterloo-Dubuque (89), 7 Davenport-Rock Island-Moline (90), 6 Evansville (97), 8 Fort Wayne (104), 6 Lansing (107), 6 Peoria-Bloomington (112), 6 Rockford (135), 4 Terre Haute (139), 5 Quincy-Hannibal-Keokuk (163), 4 Lafayette, IN (194), 1 Mankato (195), 1
12	Louisiana (One frequency)	Jackson, MS (88), 5 Shreveport (76), 7	Baton Rouge (96), 5 Lafayette, LA (124), 4 Columbus-Tupelo-West Point (131), 4 Hattesburg-Laurel (167), 2 Lake Charles (173), 3 Alexander, LA (178), 4 Meridian (183), 4
13	East Coast B	Harrisburg-Lancaster-Lebanon-York (46), 7	Baltimore (24), 7

Spot	Location	Primary DMA(s)	DMAs Covered but Not Served
	(Three frequencies)	Washington, DC (8), 15 Boston, (6), 19	Hartford & New Haven (27), 9 New York (1), 22 Providence-New Bedford (49), 8 Wilkes Barre-Scranton (52), 7 Albany-Schenectady-Troy (56), 7 Portland-Auburn (79), 8 Bangor (155), 5 Philadelphia (4), 18 Salisbury (162), 4
26	Albuquerque (One frequency)	Albuquerque-Santa Fe (50), 15	Baltimore (24), 7 Harrisburg-Lancaster-Lebanon-York (46), 7
27	Las Vegas (One frequency)	Las Vegas (51), 9	San Diego (25), 8 Los Angeles (2), 23
28	Ohio (One frequency)	Cleveland (15), 14	Pittsburgh, PA (20), 10 Johnstown-Altoona (95), 6 Cincinnati (32), 9 Columbus, OH (34), 7 Buffalo (44), 10 Louisville (48), 10 Dayton (55), 7 Charlestown-Huntington, WV (61), 12 Knoxville (63), 9 Lexington (66), 7 Tri Cities, TN (93), 7 Youngstown (99), 4 Wheeling-Stubenville (140), 3 Erie (142), 5 Bluefield-Beckley-Oak Hill (149), 4 Clarksburg-Weston (165), 4 Parkersburg (185), 1 Lima (201), 3 Zanesville (202), 1
30	East Texas (Three frequencies)	Waco-Temple-Bryan (94), 8 Victoria (204), 2 San Antonio (37), 13 Dallas-Ft. Worth (7), 18	Austin (58), 6 Tyler-Longview (108), 3
34	Georgia (Two frequencies)	New Orleans (42), 10 Greenville-Spartenburg-Ashville-Anderson (35), 11	Jacksonville-Brunswick (53), 10 Columbia, SC (85), 7 Savannah (100), 7 Charleston, SC (103), 6 Tallahassee-Thomasville (110), 5 Augusta (113), 6 Florence-Myrtle Beach (114), 5 Macon (121), 6 Columbus, GA (128), 6 Wilmington (148), 4 Albany, GA (150), 6 Gainesville (166), 4
35	Orlando (Two frequencies)	Orlando-Daytona Beach-Melbourne (21), 15 Tampa-St. Petersburg-Sarasota (14), 14	Miami-Ft. Lauderdale (16), 15 Fort Meyers-Naples (81), 7

APPENDIX G – RESUME OF WALTER L. MORGAN

EXPERIENCE

Walter L. Morgan is the President and Leading Consultant of the Communications Center, which was founded in 1980.

Mr. Morgan is involved in the design, evaluation, marketing, appraisal and the use of terrestrial and satellite systems and services.

Under his direction, many due diligence and acquisition studies have been performed by the Communications Center. These involve the review of facilities, contracts in place, future research and products and capabilities to meet contract deliveries.

His knowledge of marketing, technology and finance has been utilized in many acquisition proceedings.

From 1975 until 1980, Mr. Morgan served as the Senior Staff Scientist of COMSAT Laboratories in Clarksburg, Maryland. He also was the Project Manager on all of the commercial products.

Between 1970 and 1975, he was a member of the technical staff in the Systems Laboratory at COMSAT Laboratories and was directly involved in Intelsat, Inmarsat and COMSAT projects.

Prior to joining COMSAT, Mr. Morgan worked at RCA's David Sarnoff Research Center and the RCA Astro Electronics Division. While there, he was associated with over 20 RCA spacecraft. He provided engineering and program management services on such programs as the TIROS, ESSA, NOAA, ITOS, the Lunar Orbiter and communications satellites.

All of these spacecraft successfully fulfilled their mission objectives.

Mr. Morgan is author of a book on VSATs, the Communications Satellite Handbook, and the Principles of Communications Satellites, all of which are published by John Wiley & Sons, Inc.

ACTIVITIES

Mr. Morgan is a Senior Member of the IEEE; a Fellow of the AIAA; a Life Member of the AAAS and a Fellow of the BIS. He has been listed in American Men and Women of Science since 1960. He also appears in Who's Who in Aviation & Aerospace.

He is internationally known for his many papers and industry contributions. Mr. Morgan holds several patents relating to space and digital devices and has published over 100 papers on telecommunications.

AWARDS AND HONORS

Mr. Morgan served seven years on the International Academy of Astronautic's Space Economics and Benefits Committee.

He has been awarded the AIAA's Aerospace Communications Award *"for the consistent high level of his continuing contributions to the technology and application of communications satellites, both international and domestic."*

EDUCATION

B.S. Electrical Engineering, Carnegie-Mellon University

APPENDIX H

Copy of Appendix B to
Declaration of Jeffrey H. Rohlfs in
Satellite Broadcasting & Communications Ass'n. of America v. FCC

Appendix B

Station Characteristics by Designated Market Areas

Source: Nielsen Designated Market Areas (DMA) (Stations within DMA's) 2000-2001; Nielsen Media Research, Local Universe Estimates for the 2000-2001 Broadcast Season (Exhibit F to Plaintiffs Motion for Summary Judgment)

RANK	DMA	TVHH	% of US	Cum. %	# of TV Stations	Cum. # of TV Stations	# of S&L Stations	Cable Only Stations	Duplicate Networks in Same State	US Duplicate UPN	Foreign Independent	Cum. # of Excluded Stations	Cum. # of Stations excluding S&L, Cable, Duplicates, Foreign	Comments
1	New York	6,935,610	6.787	6.787	24	24	2					2	22	
2	Los Angeles	5,354,150	5.240	12.027	23	47	0					2	45	
3	Chicago	3,244,850	3.175	15.203	17	64	1					3	61	
4	Philadelphia	2,703,480	2.646	17.848	20	84	2					5	79	
5	San Francisco-Oakland-San Jose	2,431,720	2.380	20.228	24	108	2		1			8	100	2 WB Stations same state
6	Boston (Manchester)	2,242,240	2.194	22.422	21	129	2					10	119	2 ABC stations diff states
7	Dallas-Ft. Worth	2,069,010	2.025	24.447	18	147	0					10	137	
8	Washington, DC (Hagerstown)	2,047,340	2.004	26.451	19	166	4					14	152	2 NBC stations diff states
9	Detroit	1,873,620	1.834	28.284	10	176	0				1	15	161	
10	Atlanta	1,857,220	1.817	30.102	14	190	1					16	174	
11	Houston	1,747,350	1.710	31.812	18	208	1					17	191	
12	Seattle-Tacoma	1,605,900	1.572	33.383	16	224	1					18	206	
13	Minneapolis-St. Paul	1,510,130	1.478	34.861	19	243	6					24	219	
14	Tampa-St. Petersburg (Sarasota)	1,507,790	1.476	36.337	16	259	2		1			27	232	same state
15	Cleveland	1,486,270	1.456	37.793	15	274	1					28	246	
16	Miami-Ft. Lauderdale	1,466,630	1.437	39.230	16	290	1					29	261	
17	Phoenix	1,441,660	1.411	40.641	16	306	4					33	273	
18	Denver	1,312,300	1.284	41.926	18	324	2		1			36	288	2 CBS stations same state
19	Sacramento-Stockton-Modesto	1,187,000	1.162	43.087	16	340	5					41	299	
20	Pittsburgh	1,128,810	1.105	44.192	12	352	2					43	309	
21	Orlando-Daytona Beach-Melbourne	1,126,000	1.102	45.294	17	369	2					45	324	
22	St. Louis	1,121,410	1.097	46.391	9	378	0					45	333	
23	Portland, OR	1,017,780	0.996	47.387	10	388	0					45	343	
24	Baltimore	1,010,160	0.989	48.376	8	396	1					46	350	
25	San Diego	996,220	0.975	49.351	10	406	2					48	358	
26	Indianapolis	974,390	0.954	50.304	17	423	4					52	371	
27	Hartford & New Haven	923,740	0.904	51.208	10	433	1					53	380	
28	Charlotte	903,950	0.885	52.093	12	445	0					53	392	
29	Raleigh-Durham (Fayetteville)	873,440	0.855	52.948	13	458	1					54	404	
30	Kansas City	835,580	0.818	53.765	9	467	0					54	413	
31	Nashville	830,800	0.813	54.578	12	479	0					54	425	
32	Cincinnati	828,650	0.811	55.389	10	489	1					55	434	
33	Milwaukee	827,570	0.810	56.199	14	503	2					57	446	
34	Columbus, OH	772,160	0.756	56.955	7	510	0					57	453	
35	Greenville-Spartanburg-Asheville-Anderson	734,800	0.719	57.674	12	522	1					58	464	
36	Salt Lake City	732,380	0.717	58.391	17	539	3		1			62	477	3 PAX
37	San Antonio	693,810	0.679	59.070	15	554	1				1	64	490	
38	Grand Rapids-Kalamazoo-Battle Creek	683,120	0.668	59.738	10	564	1		1			66	498	2 ABC stations same state
39	Birmingham (Anniston and Tuscaloosa)	673,940	0.660	60.398	15	579	4			1		71	508	
40	Memphis	641,630	0.628	61.025	11	590	2					73	517	
41	Norfolk-Portsmouth-Newport News	638,190	0.625	61.650	9	599	1					74	525	
42	New Orleans	636,340	0.623	62.273	10	609	0					74	535	
43	West Palm Beach-Ft. Pierce	632,600	0.619	62.892	12	621	2					76	545	
44	Buffalo	618,660	0.605	63.497	10	631	0					76	555	
45	Oklahoma City	604,240	0.591	64.089	13	644	3					79	565	
46	Harrisburg-Lancaster-Lebanon-York	604,210	0.591	64.680	7	651	0					79	572	
47	Greensboro-High Point-Winston Salem	600,000	0.587	65.267	9	660	0					79	581	
48	Louisville	587,450	0.575	65.842	11	671	1					80	591	
49	Providence-New Bedford	572,860	0.561	66.403	9	680	1					81	599	
50	Albuquerque-Santa Fe	570,460	0.558	66.961	24	704	8			1		90	614	

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Station Characteristics by Designated Market Areas

RANK	DMA	TVHH	% of US	Cum. %	# of TV Stations	Cum. # of TV Stations	# of S&L Stations	Cable Only Stations	Duplicate Networks in Same State	US Duplicate UPN	Foreign Independent	Cum. # of Excluded Stations	Cum. # of Stations excluding S&L, Cable, Duplicates, Foreign	Comments
51	Las Vegas	559,330	0.547	67.508	12	716	4					93	623	
52	Wilkes Barre-Scranton	550,340	0.539	68.047	9	725	2					95	630	
53	Jacksonville, Brunswick	548,750	0.537	68.584	11	736	1					96	640	
54	Fresno-Visalia	519,200	0.508	69.092	12	748	0					96	652	
55	Dayton	515,160	0.504	69.596	8	756	1					97	659	
56	Albany-Schenectady-Troy	508,470	0.498	70.094	9	765	2					99	666	
57	Little Rock-Pine Bluff	491,830	0.481	70.575	14	779	3					102	677	
58	Austin	491,820	0.481	71.056	9	788	3					105	683	
59	Tulsa	490,160	0.480	71.536	14	802	2					107	695	
60	Richmond-Petersburg	489,320	0.479	72.015	8	810	1					108	702	
61	Charleston-Huntington	481,200	0.471	72.486	13	823	1					109	714	
62	Mobile-Pensacola (Ft Walton Beach)	466,680	0.459	72.944	11	834	0					109	725	
63	Knoxville	461,950	0.452	73.397	9	843	0					109	734	
64	Flint-Saginaw-Bay City	448,990	0.439	73.836	12	855	4					113	742	
65	Wichita-Hutchinson Plus	444,710	0.435	74.271	20	875	10					123	752	
66	Lexington	424,010	0.415	74.686	12	887	4		1			128	759	2 CBS Stations same state
67	Toledo	413,910	0.405	75.091	7	894	1					129	765	
68	Roanoke-Lynchburg	407,480	0.399	75.490	8	902	1					130	772	
69	Green Bay-Appleton	398,510	0.390	75.880	7	909	0					130	779	
70	Des Moines-Ames	393,960	0.386	76.265	7	916	0					130	786	
71	Tucson (Sierra Vista)	391,930	0.384	76.649	10	926	2					132	794	
72	Honolulu	382,720	0.375	77.024	25	951	13					145	806	
73	Paducah-Cape Girardeau-Harrisburg-Mt Vernon	376,780	0.369	77.392	11	962	2					147	815	
74	Rochester, NY	376,740	0.369	77.761	7	969	2					149	820	
75	Omaha	375,070	0.367	78.128	8	977	1					150	827	
76	Shreveport	371,020	0.363	78.491	8	985	1					151	834	
77	Spokane	370,080	0.362	78.853	10	995	1					152	843	
78	Springfield, MO	369,070	0.361	79.214	9	1004	3					155	849	
79	Portland-Auburn	362,660	0.355	79.569	9	1013	1					156	857	
80	Syracuse	361,650	0.354	79.923	7	1020	0					156	864	
81	Ft. Myers-Naples	352,240	0.345	80.268	8	1028	1					157	871	
82	Huntsville-Decatur (Flor)	351,860	0.344	80.612	8	1036	0					157	879	
83	Champaign&Springfield-Decatur	345,420	0.338	80.950	11	1047	3					160	887	
84	Madison	329,190	0.322	81.272	6	1053	0					160	893	
85	Columbia, SC	324,060	0.317	81.590	7	1060	0					160	900	
86	Chattanooga	323,170	0.316	81.906	8	1068	0					160	908	
87	South Bend-Elkhart	318,770	0.312	82.218	7	1075	2					162	913	
88	Jackson, MS	307,850	0.301	82.519	6	1081	1					163	918	
89	Cedar Rapids-Waterloo&Dubuque	307,310	0.301	82.820	9	1090	2					165	925	
90	Davenport-Rock Island-Moline	303,370	0.297	83.117	7	1097	1					166	931	
91	Burlington-Plattsburgh	300,650	0.294	83.411	14	1111	6					172	939	2 NBC stations diff states
92	Colorado Springs-Pueblo	298,600	0.292	83.703	8	1119	3					175	944	
93	Tri-Cities, TN-VA	295,260	0.289	83.992	8	1127	1					176	951	
94	Waco-Temple-Bryan	286,720	0.281	84.273	11	1138	2		1			179	959	2 CBS stations same state
95	Johnstown-Altoona	283,140	0.277	84.550	6	1144	0					179	965	
96	Baton Rouge	280,130	0.274	84.824	7	1151	2					181	970	
97	Evansville	276,070	0.270	85.094	11	1162	3					184	978	
98	El Paso	275,850	0.270	85.364	11	1173	0				1	185	988	
99	Youngstown	272,500	0.267	85.631	6	1179	2					187	992	
100	Savannah	260,340	0.255	85.886	8	1187	0	1				188	999	

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Station Characteristics by Designated Market Areas

RANK	DMA	TVHH	% of US	Cum. %	# of TV Stations	Cum. # of TV Stations	# of S&L Stations	Cable Only Stations	Duplicate Networks in Same State	US Duplicate UPN	Foreign Independent	Cum. # of Excluded Stations	Cum. # of Stations excluding S&L, Cable, Duplicates, Foreign	Comments
														2 ABC stations same state
101	Lincoln & Hastings-Kearney	256,280	0.253	86.136	14	1201	7	1	1			197	1004	
102	McAllen	256,810	0.251	86.390	15	1216	2	1			3	203	1013	
103	Charleston, SC	252,560	0.247	86.637	7	1223	0	1				204	1019	
104	Ft. Wayne	252,500	0.247	86.884	7	1230	0	1				205	1025	
105	Springfield-Holyoke	244,790	0.240	87.123	3	1233	0					205	1028	
106	Greenville-New Bern-Washington	242,290	0.237	87.361	11	1244	2	1				208	1036	
107	Lansing	240,570	0.235	87.596	7	1251	0	1				209	1042	
108	Tyler-Longview (Lufkin&Nacogdoches)	237,650	0.233	87.829	8	1259	4	1				214	1045	
109	Reno	232,960	0.228	88.057	11	1270	2	1	1			218	1052	
110	Tallahassee-Thomasville	232,270	0.227	88.284	9	1279	3	1				222	1057	
111	Sioux Falls(Mitchell)	231,550	0.227	88.510	19	1298	10	1				233	1065	
112	Peoria-Bloomington	231,350	0.226	88.737	7	1305	0	1				234	1071	
113	Augusta	230,420	0.225	88.962	8	1313	1	1				236	1077	
114	Florence-Myrtle Beach	230,260	0.225	89.188	8	1321	2	1				239	1082	
115	Ft. Smith-Fayetteville-Springdale-Rogers	227,670	0.223	89.410	10	1331	4	1				244	1087	
116	Montgomery (Selma)	227,410	0.223	89.633	11	1342	3	1				248	1094	
117	Santa Barbara-Santa Maria-San Luis Obispo	227,240	0.222	89.855	7	1349	2					250	1099	
118	Monterey-Salinas	223,650	0.219	90.074	7	1356	1	1				252	1104	
119	Traverse City-Cadillac	222,960	0.218	90.292	11	1367	5	1				258	1109	
120	Fargo-Valley City	220,770	0.216	90.509	12	1379	5	1				264	1115	
121	Macon	211,800	0.207	90.716	7	1386	0	1				265	1121	
122	Eugene	210,910	0.206	90.922	13	1399	6	1				272	1127	
123	Boise	208,820	0.202	91.125	7	1406	0	1				273	1133	
124	Lafayette, LA	208,120	0.202	91.326	7	1413	2	1				276	1137	
125	Yakima-Pasco-Richland-Kennewick	203,450	0.199	91.525	14	1427	6	1				285	1142	
126	La Crosse-Eau Claire	191,720	0.188	91.713	9	1436	3	1				289	1147	
127	Amarillo	189,880	0.186	91.899	8	1444	2	1				292	1152	
128	Columbus, GA	187,400	0.183	92.082	7	1451	0	1				293	1156	
129	Corpus Christi	185,570	0.182	92.264	9	1460	3	1				297	1163	
130	Bakersfield	185,120	0.181	92.445	7	1467	2	1				300	1167	
131	Columbus-Tupelo-West Point	177,480	0.174	92.619	6	1473	1	1				302	1171	
132	Duluth-Superior	177,080	0.173	92.792	7	1480	1	1				304	1176	
133	Chico-Redding	176,090	0.172	92.964	7	1487	1	1				306	1181	
134	Monroe-El Dorado	174,000	0.170	93.135	7	1494	0	1				307	1187	
135	Rockford	169,550	0.166	93.301	5	1499	0	1				308	1191	
136	Wausau-Rhinelander	167,790	0.164	93.465	8	1507	2	1				311	1196	
137	Beaumont-Port Arthur	165,030	0.161	93.626	5	1512	0	1				312	1200	
138	Topeka	162,940	0.159	93.786	6	1518	1	1				314	1204	
139	Terre Haute	157,290	0.154	93.940	7	1525	1	1				316	1209	
140	Wheeling-Steubenville	156,150	0.153	94.092	4	1529	0	1				317	1212	
141	Medford-Klamath Falls	154,800	0.151	94.244	9	1538	2	1				320	1218	
142	Erie	153,110	0.150	94.394	6	1544	0	1				321	1223	
143	Columbia-Jefferson City	152,280	0.149	94.543	7	1551	1	1				323	1228	
144	Sioux City	149,940	0.147	94.690	7	1558	0	1				324	1234	
145	Joplin-Pittsburg	148,180	0.145	94.835	7	1565	2	1				327	1236	
146	Wichita Falls & Lawton	147,590	0.144	94.979	6	1571	1	1				329	1242	
147	Lubbock	141,990	0.139	95.118	12	1583	4	1				334	1249	
148	Wilmington, NC	139,230	0.136	95.254	6	1589	1	1				336	1253	
149	Bluefield-Beckley-Oak Hill	139,070	0.136	95.390	5	1594	0	1				337	1257	
150	Albany, GA	139,060	0.136	95.526	8	1602	1	1				339	1263	

Source: Nielsen Designated Market Areas (DMA) (Stations within DMA's) 2000-2001; Nielsen Media Research, Local Universe Estimates for the 2000-2001 Broadcast Season (Exhibit F to Plaintiffs Motion for Summary Judgment)

Station Characteristics by Designated Market Areas

RANK	DMA	TVHH	% of US	Cum. %	# of TV Stations	Cum. # of TV Stations	# of S&L Stations	Cable Only Stations	Duplicate Networks in Same State	US Duplicate UPN	Foreign Independent	Cum. # of Excluded Stations	Cum. # of Stations excluding S&L, Cable, Duplicates, Foreign	Comments
151	Odessa-Midland, TX	138,300	0.135	95.662	8	1610	1	1				341	1269	
152	Minot-Bismarck-Dickinson (Williston), ND	136,000	0.133	95.795	19	1629	12	1				354	1275	
153	Rochester, MN-Mason City, IA-Austin, MN	134,450	0.132	95.926	7	1636	0	1				355	1281	
154	Anchorage, AK	130,800	0.128	96.054	11	1647	3	1				359	1288	
155	Bangor, ME	129,600	0.127	96.181	7	1654	1	1				361	1293	
156	Binghamton, NY	127,210	0.124	96.306	6	1660	1	1				363	1297	
157	Biloxi-Gulfport, MS	127,210	0.124	96.430	4	1664	0	1				364	1300	
158	Panama City, FL	124,010	0.121	96.552	6	1670	0	1				365	1305	
159	Palm Springs, CA	118,330	0.116	96.667	9	1679	6	1				372	1307	
160	Abilene-Sweetwater, TX	114,350	0.112	96.779	7	1686	2	1				375	1311	
161	Sherman, TX-Ada, OK	114,330	0.112	96.891	4	1690	1	1				377	1313	
162	Salisbury, MD	111,800	0.109	97.001	5	1695	0	1				378	1317	
163	Quincy, IL-Hannibal, MO-Keokuk, IA	111,140	0.109	97.109	6	1701	1	1				380	1321	
164	Idaho Falls-Pocatello, ID	106,310	0.104	97.213	7	1708	1	1				382	1326	
165	Clarksburg-Weston, WV	106,080	0.104	97.317	5	1713	0	1				383	1330	
166	Gainesville, FL	105,610	0.103	97.421	4	1717	0					383	1334	
167	Hattiesburg-Laurel, MS	10,850	0.099	97.431	3	1720	0	1				384	1336	
168	Utica, NY	99,070	0.097	97.528	5	1725	1	1				386	1339	
169	Billings, MT	96,010	0.094	97.622	6	1731	1	1				388	1343	
170	Missoula, MT	93,170	0.091	97.713	8	1739	3	1				392	1347	
171	Elmira, NY	93,090	0.091	97.804	4	1743	0	1				393	1350	
172	Dothan, AL	92,070	0.090	97.894	4	1747	0	1				394	1353	
173	Lake Charles, LA	88,630	0.087	97.981	4	1751	0	1				395	1356	
174	Yuma, AZ-El Centro, CA	88,530	0.087	98.068	5	1756	0	1				396	1360	
175	Rapid City, SD	84,880	0.083	98.151	15	1771	8	1				405	1366	
176	Watertown, NY	84,200	0.082	98.233	6	1777	2	1				408	1369	
177	Marquette, MI	82,990	0.081	98.314	5	1782	0	1				409	1373	
178	Alexandria, LA	81,540	0.080	98.394	5	1787	0	1				410	1377	
179	Harrisonburg, VA	78,920	0.077	98.472	4	1791	1					411	1380	
180	Jonesboro, AR	77,570	0.076	98.547	4	1795	0	1				412	1383	
181	Bowling Green, KY	76,180	0.075	98.622	5	1800	0	1				413	1387	
182	Greenwood-Greenville, MS	75,600	0.740	98.696	4	1804	0	1				414	1390	
183	Meridian, MS	68,390	0.067	98.763	5	1809	0	1				415	1394	
184	Jackson, TN	65,180	0.064	98.827	4	1813	0	1				416	1397	
185	Parkersburg, WV	61,850	0.060	98.887	2	1815	0	1				417	1398	
186	Grand Junction-Montrose, CO	60,740	0.059	98.947	9	1824	3	1				421	1403	
187	Great Falls, MT	60,720	0.059	99.006	4	1828	0	1				422	1406	
188	Twin Falls, ID	57,560	0.056	99.062	6	1836	4	1				427	1409	
189	Laredo, TX	57,270	0.056	99.118	6	1842	0	1			1	429	1413	
190	Butte-Bozeman, MT	55,370	0.054	99.173	6	1848	1	1				431	1417	
191	Eureka, CA	55,320	0.054	99.227	5	1853	0					431	1422	
192	St. Joseph, MO	54,200	0.053	99.280	3	1856	0	1				432	1424	
193	Charlottesville, VA	54,000	0.053	99.333	3	1859	1					433	1426	
194	Lafayette, IN	53,620	0.052	99.385	1	1860	0					433	1427	
195	Mankato, MN	52,950	0.052	99.437	2	1862	0	1				434	1428	
196	San Angelo, TX	51,370	0.050	99.487	5	1867	1	1				436	1431	
197	Casper-Riverton, WY	50,640	0.050	99.537	11	1878	6	1				443	1435	
198	Cheyenne, WY-Scottsbluff, NE	50,410	0.049	99.586	6	1884	1	1				445	1439	
199	Ottumawa, IA-Kirksville, MO	48,600	0.048	99.634	3	1887	0	1				446	1441	
200	Bend, OR	43,230	0.042	99.676	4	1891	1	1				448	1443	

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RANK	DMA	TVHH	% of US	Cum. %	# of TV Stations	Cum. # of TV Stations	# of S&L Stations	Cable Only Stations	Duplicate Networks in Same State	US Duplicate UPN	Foreign Independent	Cum. # of Excluded Stations	Cum. # of Stations excluding S&L, Cable, Duplicates, Foreign	Comments
201	Lima, OH	38,430	0.038	99.714	6	1897	2	1				451	1446	
202	Zanesville, OH	32,340	0.032	99.745	2	1899	0	1				452	1447	
203	Fairbanks, AK	30,530	0.030	99.775	6	1905	1					453	1452	
204	Victoria, TX	29,070	0.028	99.804	4	1909	1	1				455	1454	
205	Presque Isle, ME	27,360	0.027	99.830	3	1912	0	1				456	1456	
206	Juneau, AK	23,540	0.023	99.853	7	1919	3					459	1460	
207	Helena, MT	21,570	0.021	99.874	4	1923	1	1				461	1462	
208	Alpena, MI	16,810	0.016	99.891	2	1925	0					461	1464	
209	North Platte, NE	14,970	0.015	99.906	5	1930	1	1				463	1467	
210	Glendive, MT	4,880	0.005	99.910	2	1932	0	1				464	1468	
	Total	102,184,180			1932		345	101	9	2	7			