KHIZ-DT established in the Appendix B DTV Table of Allotments.[3] It is a communications site near Victorville, CA, and is the site from which the station has operated throughout its history. It does now and will continue to provide service to the principal community of Barstow, CA. It is the site for which an application already has been filed for a license to cover the facilities authorized in the construction permit currently held by the station.

The two new transmitter locations involve sites currently used by other television broadcasters. The site at Mt Harvard serves the Los Angeles basin and is part of the complex, together with Mt Wilson, at which transmitters for almost all other television stations in the Los Angeles market are situated. It is a shared site operated by American Tower Corporation. Locating a gap filler transmitter there effectively collocates it with its adjacent channel neighbors, thereby reducing interference to the adjacent channel stations. The Snow Peak site is a communications facility and also currently is used by the transmitter for Station KVMD-DT. It is privately owned, and KHIZ-DT will be a tenant of both the site owner and of KVMD for different aspects of the Snow Peak facility. The Snow Peak transmitter will provide a second DTV service to an area that currently is served by only one DTV station and no analog stations, as well as providing additional service in surrounding underserved areas.

Facilities

The facilities requested in this application include continued operation at 1000 kW ERP at a height above average terrain of 597 meters at the Quartzite site, operation at almost 170 kW ERP at 879 meters HAAT at Mt Harvard, and operation at 40 kW ERP at 768 meters HAAT at Snow Peak. The currently authorized facility at the Quartzite site meets the requirements of §73.622(f)(5) as it does not exceed "that needed to provide the same geographic coverage area as the largest station within [its] market." The relationships between the parameters in the cases of the added gap-filler transmitters result in power/height combinations that meet the requirements for maximum allowable facilities

[3] Memorandum Opinion and Order on Reconsideration of the Seventh Report and Order and the Eighth Report and Order *In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, MB Docket No. 87-268 (FCC 08-72, released March 6, 2008).

specified by the formula in §73.622(f)(8)(ii) of the Commission's Rules. The basic characteristics of each of the transmitters proposed in the KHIZ-DT DTS network are given in Figures 1a, 1b, and 1c at the end of this report and in the related DTS Engineering portions of the Form 301 application – one for each transmitter.

Three fundamental antenna designs are proposed for use in the KHIZ-DT DTS network. The Quartzite antenna is a cardioid, end-fed, slotted coaxial design with characteristics primarily intended to provide sufficient gain in both its azimuth and elevation patterns to meet the KHIZ-DT service objectives while permitting a more physically robust antenna to be installed than was originally put into operation by the station. As was noted in the Technical Statement that accompanied the application for the construction permit that this application seeks to modify, the original antenna twice failed physically. Consequently, it was necessary to add azimuth gain by reducing service in an area having little to no population in order to continue providing full service throughout the remainder of the KHIZ-DT service area. This situation and its solution were fully described in that earlier Technical Statement.

The antenna designs at Mt Harvard and Snow Peak will be similar, cavity-slot panel arrays, using panels that have azimuth patterns shaped through use of parasitic elements. Each will consist of a total of six panels in a single column. The Mt Harvard pattern will have a single main lobe, while the Snow Peak pattern will have a pair of main lobes in a "peanut" pattern. The azimuth patterns will be rather narrow in their main beams, with a smaller amount of radiation in other directions. A significant amount of electrical beam tilt will be used, with a sharp cut-off of the radiation above the main beam to control the extent of signal projection from each of the antennas, given their very high locations, to permit better control of interference to adjacent regions and within the DTS network. In addition, a small amount of mechanical beam tilt also will be applied to each antenna to position the contours as close to the authorized contour as possible while minimizing projections beyond the authorized contour.

A plot of the PNLCs[4] of the various transmitters is provided in Figure 2. Since the main, Quartzite Mountain transmitter facility authorized by the outstanding construction permit (herein DTS Site 1) already covers the entire authorized service area of the station,[5] the provisions of §73.626(f)(1) are met by that facility alone. By virtue of the overlap of the contours of the three transmitters, they are contiguous, thereby meeting the requirements of §73.626(f)(3). Also shown in Figure 2 is the 48 dBu contour of the DTS Site 1 facility, which can be seen to encompass the principal community of Barstow, CA. There are no major obstructions in the path over the principal community; thus, the requirements of §73.625(a) and correspondingly of §73.626(f)(4) also are met by the DTS Site 1 transmitter alone. All three transmitters in the proposed DTS network are located within the KHIZ authorized service area, consequently meeting the requirements of §73.626(f)(6).

Although they were filed in the Technical Statement accompanying the original construction permit application that this application now seeks to modify, a description and plots of the pattern characteristics for the DTS Site 1 (Quartzite) antenna nevertheless are reproduced herein. The DTS Site 1 antenna is oriented to place the center of the cardioid azimuth pattern at 218 degrees true. Elevation power gain of the antenna is 23.50 (13.71 dBd) at the vertical beam maximum (1.0 degree below horizontal), 12.10 (10.83 dBd) in the horizontal plane, and 22.02 (13.43 dBd) at 0.677 degree below horizontal, the average depression angle to the radio horizon (computed at 1-degree azimuth intervals). The azimuth power gain is 1.60 (2.04 dB), yielding a total power gain in the main beam of 37.60 (15.75 dBd), in the horizontal plane of 19.36 (12.87 dBd), and toward the radio horizon of 35.23 (15.47 dBd).

A plot of the azimuthal radiation pattern of the DTS Site 1 antenna in relative field values is included as Figure 3. The azimuthal power pattern expressed in decibels relative to 1 kW (dBk), at the depression angle having maximum power (1 degree depression), is

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[4] To account for the dipole correction factor, the PNLCs are plotted at 41.5 dBu, with service statistics of F(50,90).

[5] Per §73.626(b), "For purposes of compliance with this section, a station's 'authorized service area' is defined as the area within its predicted noise-limited service contour determined using the facilities authorized for the station in a license or construction permit for non-DTS, single-transmitter-location operation."

plotted in Figure 4. The tabulated azimuthal field and power values are given in Figure 5. The elevation radiation pattern in relative field values is included as Figure 6. The elevation power pattern expressed in decibels relative to 1 kW (dBk) is plotted in Figure 7. The tabulated elevation field and power values are given in Figure 8. Also uploaded to the CDBS Electronic Filing System (EFS) web site is a version of the elevation pattern in Office Open XML format, with the first column containing depression angle values and the second column containing relative field values of elevation pattern data. Only a single elevation pattern applies to the antenna, and there is no mechanical beam tilt, so only a single column of elevation data is supplied.

The antennas for DTS Site 2 (Mt Harvard) and DTS Site 3 (Snow Peak) are similar to one another in their basic designs, the major difference being the azimuth patterns created by the attached parasitic elements. They also have slightly different electrical beam tilt characteristics, with the DTS Site 2 antenna having its main beam at a depression angle of 3.8 degrees, while the DTS Site 3 antenna has its main beam at a depression angle of 3.5 degrees. Each antenna has somewhat different mechanical beam tilt applied in addition to the electrical beam tilt. Their characteristics and orientations are fully described in Figures 1b and 1c. Because mechanical beam tilt will be used and complete elevation data for the antennas for DTS Sites 2 and 3 is being supplied through files input to the CDBS Electronic Filing System, the azimuth pattern plots supplied in this Technical Statement and the azimuth pattern data supplied in the CDBS input document are for reference only and are at right angles to the axes of the antennas in their respective main beams (i.e., at 3.8 degrees depression for the Site 2 antenna and at 3.5 degrees depression for Site 3). Consequently, the azimuth patterns and data do not take account of the mechanical beam tilt, the effect of which is reflected wholly within the elevation data files.

The essential elevation pattern design of the antennas for DTS Sites 2 and 3 is somewhat unusual. It includes main beams at depression angles of 3.8 and 3.5 degrees, with a rapid fall-off of relative field values above the main beams to deep nulls at depression angles of 0.8 and 0.5 degrees, respectively. The nulls serve two purposes: They help to control the locations of the contours while permitting stronger field strengths to be delivered within the service areas, and they help in controlling interference to stations in neighboring markets. The latter consideration is significant in the discussion below on Border Issues. The elevation pattern design also includes a relatively broad peak and significant power levels to depression angles of approximately 17 degrees, thereby providing strong signals to the areas below the mountains on which the gap-filler transmitters are situated.

Elevation power gain of the antenna design for DTS Site 2 is 7.50 (8.75 dBd) at the beam maximum (3.8 degrees below horizontal), less than 0.0015 (–28 dBd) at the null above the main beam (0.8 degrees below horizontal), and 0.916 (–0.38 dBd) in the horizontal plane. The azimuth power gain is 5.70 (7.56 dB), yielding a total power gain in the main beam of 42.66 (16.30 dBd) and of 5.22 (7.18 dBd) in the horizontal plane. All plane and depression angle values are with respect to the antenna axis prior to the effects of any mechanical beam tilt. Because of the mechanical beam tilt applied to this antenna, effective radiated power toward the radio horizon is an inappropriate parameter for this antenna and therefore is not provided.

Equivalent characteristics for the DTS Site 3 antenna are elevation power gain of 7.55 (8.78 dBd) at the beam maximum (3.5 degrees below horizontal), less than 0.0015 (–28 dBd) at the null above the main beam (0.5 degrees below horizontal), and 0.095 (–10.2 dBd) in the horizontal plane. The azimuth power gain is 2.90 (4.62 dB), yielding a total power gain in the main beam of 21.93 (13.41 dBd) and of 0.277 (–5.58 dBd) in the horizontal plane. All plane and depression angle values are with respect to the antenna axis prior to the effects of any mechanical beam tilt. Again, because of the mechanical beam tilt applied to this antenna, effective radiated power toward the radio horizon is an inappropriate parameter for this antenna and therefore is not provided.

Plots of the DTS Sites 2 and 3 antenna azimuthal radiation patterns in relative field values are included as Figures 9a and 9b. The azimuthal power patterns expressed in decibels relative to 1 kW (dBk), at the depression angles having maximum power (3.8 and 3.5 degrees depression, respectively), are plotted in Figures 10a and 10b. The tabulated azimuthal field and power values are given in Figures 11a and 11b. The elevation radiation patterns in relative field values are included as Figures 12a and 12b.

The elevation power patterns expressed in decibels relative to 1 kW (dBk), in the azimuthal directions having maximum power, are plotted in Figures 13a and 13b. The tabulated elevation field and power values are given in Figures 14a and 14b. All of these plots and tables are prior to application of mechanical beam tilt and therefore do not incorporate its effects, which are fully expressed in the data of the elevation patterns placed on file in the online application. The elevation pattern data for each antenna has been uploaded to the CDBS Electronic Filing System (EFS) web site in array form in Office Open XML format, with the first columns containing depression angle values and the first rows containing azimuth values for each column.

Although only a single elevation pattern applies to each of the antennas for DTS Sites 2 and 3, mechanical beam tilt will be applied to each of them. Since the software that the Commission will use to evaluate this application is not yet capable of applying mechanical beam tilt, the pattern rotation implicit in mechanical beam tilt has been pre-applied to the data provided through the EFS. Consequently, a large array of elevation data has been supplied for each antenna. Correspondingly, the Forms 301 DTS have been marked that no mechanical beam tilt and, similarly, that no azimuth rotation is applicable because they already have been built into the data arrays uploaded with the application forms. The actual azimuth rotations and mechanical beam tilt angles and headings for the antennas at DTS Sites 2 and 3 are provided in Figures 1b and 1c below.

All of the transmitters to be used in the KHIZ-DT DTS network will be Type Verified as per Section 73.1660 of the Commission's Rules. All transmitters will be of solid state designs. They will be synchronized using the methods specified in the ATSC Synchronization Standard for Distributed Transmission (A/110B), and they will emit the RF Watermark transmitter identification signal defined in the A/110B document.

Largest In Market Calculation and Service Areas

As noted above, §73.622(f)(5) provides that stations may exceed the limits on power and antenna height included in §73.622(f)(6) through (8) "up to that needed to provide the same geographic coverage area as the largest station within their market." The DTS R&O applies the same exception to DTS operations. In ¶35 "Largest Station"

Figure 1b — Technical Specifications — Proposed KHIZ-DTS Facility
Channel 44 — Barstow, CA — Site 2: Mt Harvard

Frequency

Channel	44
Frequency Band	650 – 656 MHz
Center Frequency	653 MHz

Location

Site	Mt Harvard, Mt Wilson, CA
Geographic Coordinates (NAD27)	34° 12’ 47.78” N 118° 03’ 40.95” W
Tower Registration (FAA Study Number)	1213941 (2008-AWP-2591-OE)

Elevation

Elevation of site above mean sea level	1654.8 m
Overall height of tower above site elevation	60.9 m
Overall height of tower above mean sea level	1715.7 m
Height of antenna radiation center above site elevation	30.5 m
Elevation of average terrain (45-degree-spaced radials, 3.2-16.1 km)	797.6 m
Height of antenna radiation center above mean sea level	1685.3 m
Height of antenna radiation center above average terrain (HAAT)	878.9m

Antenna

Manufacturer	Radio Frequency Systems
Model	DX24-D-44
Description	Side-Mounted UHF Cavity-Slot
Orientation (rotation around vertical axis)	152° true
Electrical beam tilt	3.8°
Mechanical beam tilt	0.1° down toward 210° true
Polarization	Horizontal
Gain (in horizontal plane – 0° depression)	5.22 (7.18 dB)
Gain (peak of beam – 3.8° depression)	42.66 (16.30 dB)

Power

Effective radiated power (ERP) (main beam – 1.0° depression)	169.3 kW
Effective radiated power (ERP) (horizontal plane)	20.72 kW

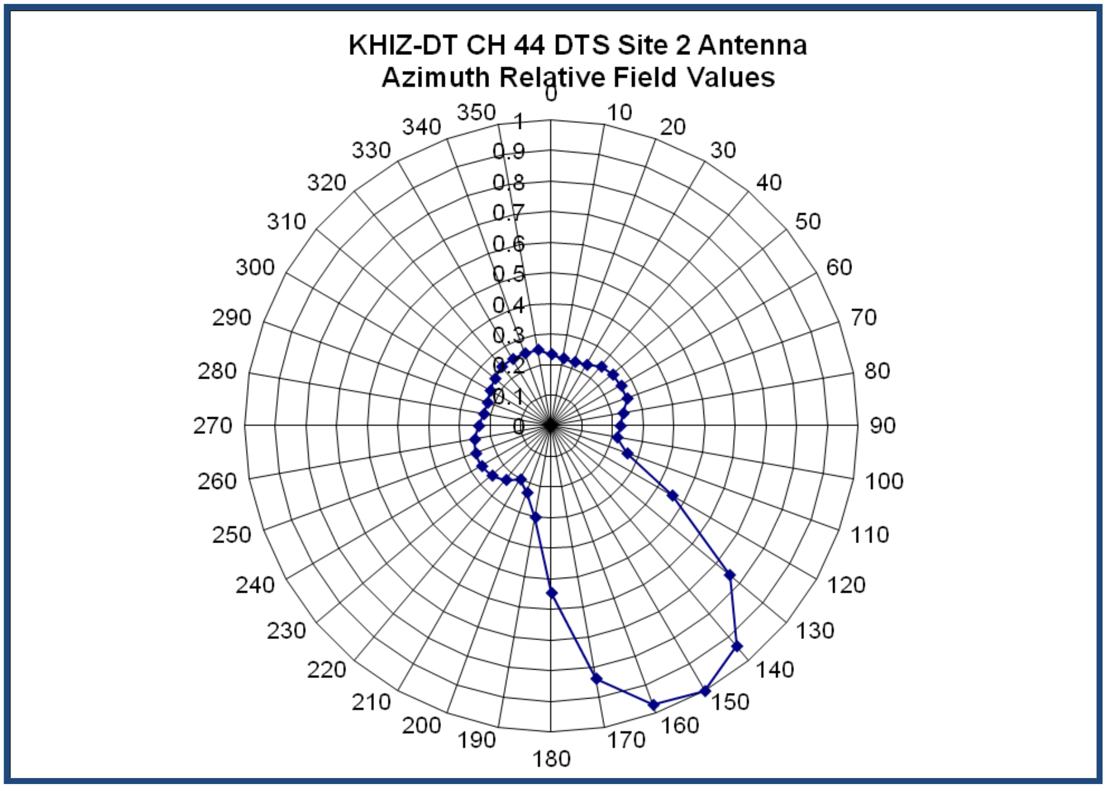

Figure 9a — DTS Site 2 Antenna Azimuth Relative Field Values

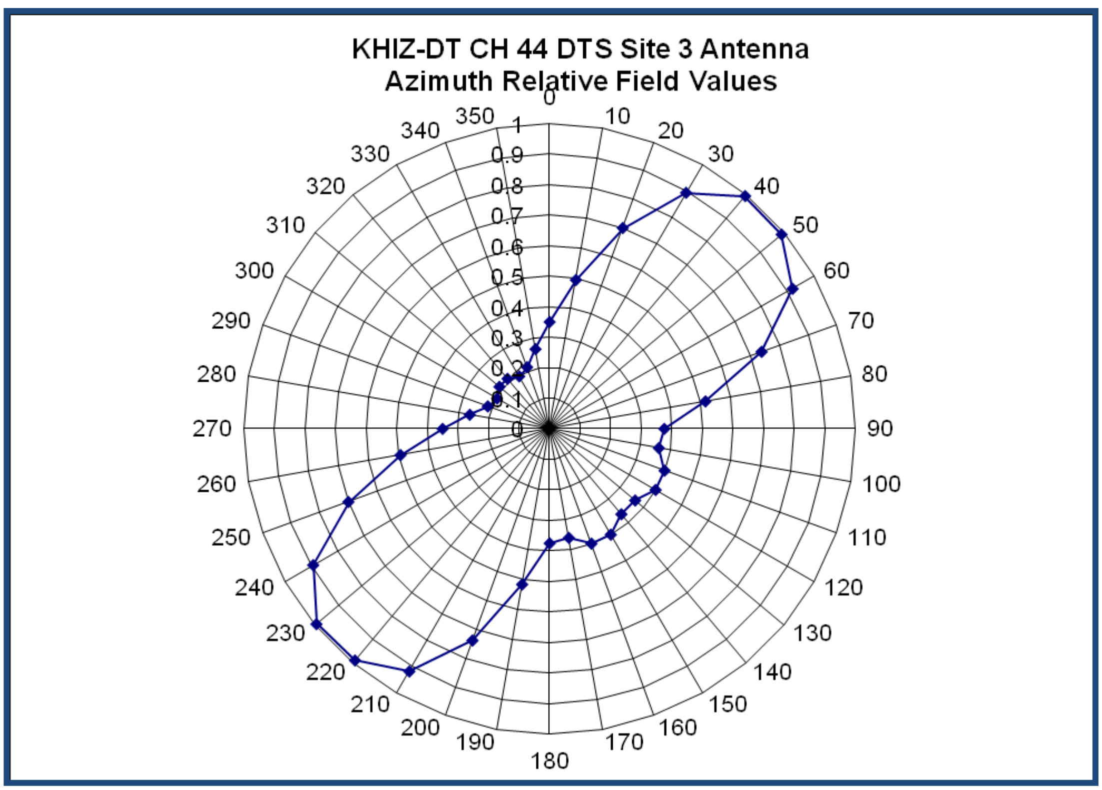

Figure 9b — DTS Site 3 Antenna Azimuth Relative Field Values

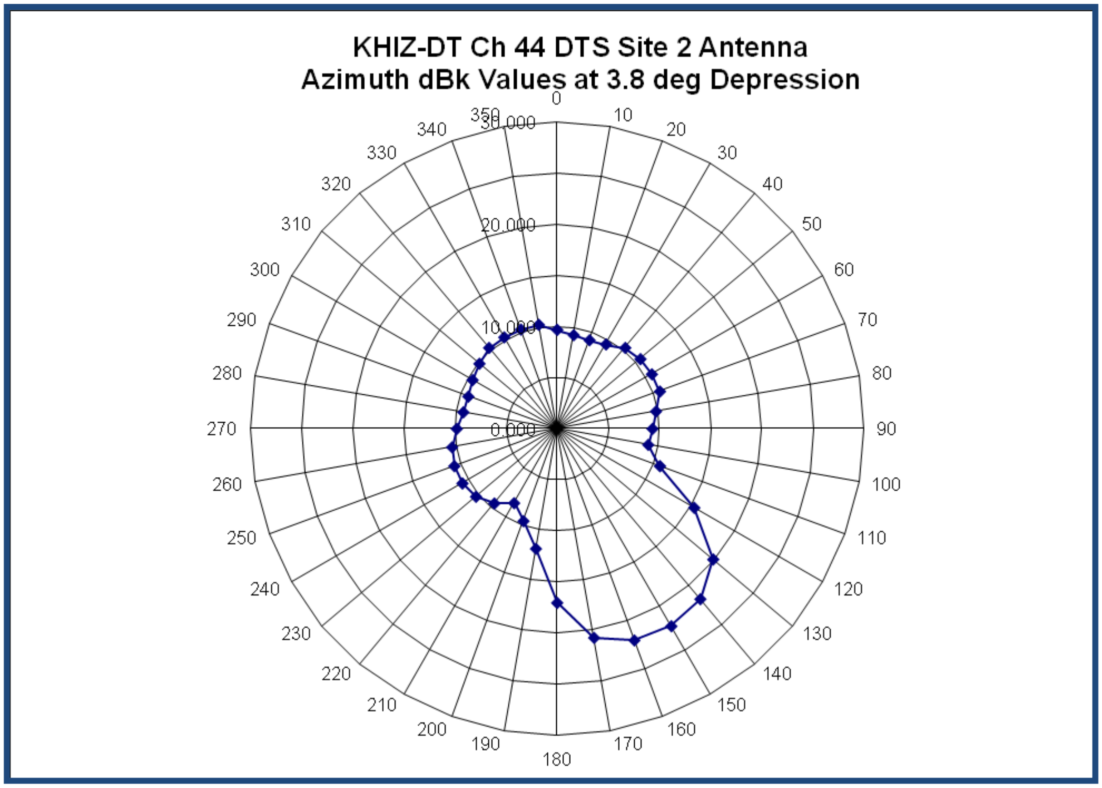

Figure 10a — DTS Site 2 Antenna Azimuth dBk Values

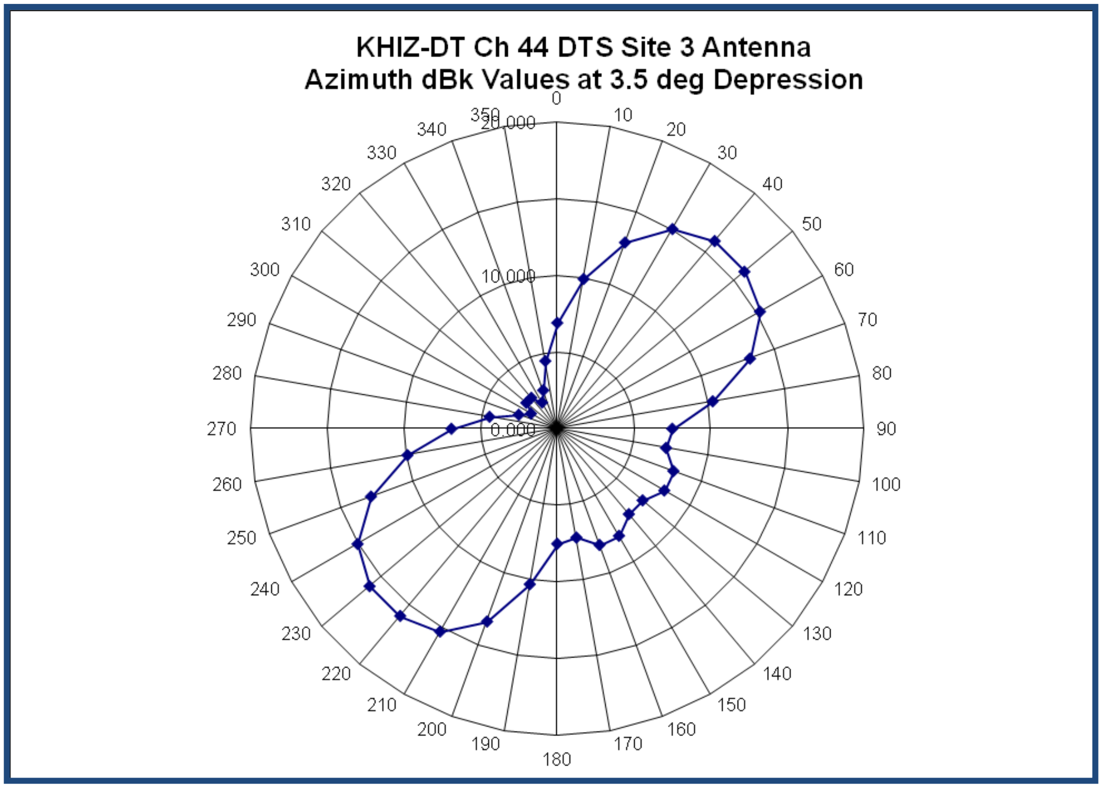

Figure 10b — DTS Site 3 Antenna Azimuth dBk Values

Figure 11a— KHIZ-DT Site 2 Azimuthal Radiation Pattern Tabulated Values

Azimuth	Relative Field	Effective Radiated Power (dBk)	Azimuth	Relative Field	Effective Radiated Power (dBk)
0	0.234	9.682	180	0.546	17.022
10	0.224	9.299	190	0.303	11.915
20	0.222	9.221	200	0.232	9.608
30	0.230	9.532	min 210	0.202	8.394
40	0.253	10.332	220	0.230	9.532
50	0.261	10.606	230	0.253	10.332
60	0.263	10.672	240	0.263	10.672
70	0.263	10.672	250	0.263	10.672
80	0.237	9.796	260	0.255	10.400
90	0.224	9.299	270	0.237	9.796
min 94	0.202	8.394	280	0.224	9.299
100	0.217	9.024	290	0.222	9.221
110	0.263	10.672	300	0.230	9.532
120	0.455	15.437	310	0.240	9.905
130	0.758	19.875	320	0.253	10.332
140	0.939	21.744	330	0.253	10.332
max 150	1.000	22.287	340	0.253	10.332
160	0.970	22.019	350	0.253	10.332
170	0.838	20.756			

Notes: Derived from data supplied by manufacturer. Complete data set available upon request.

Does not show the effects of mechanical beam tilt, which are included only in the file uploaded within Form 301 on FCC Electronic Filing System

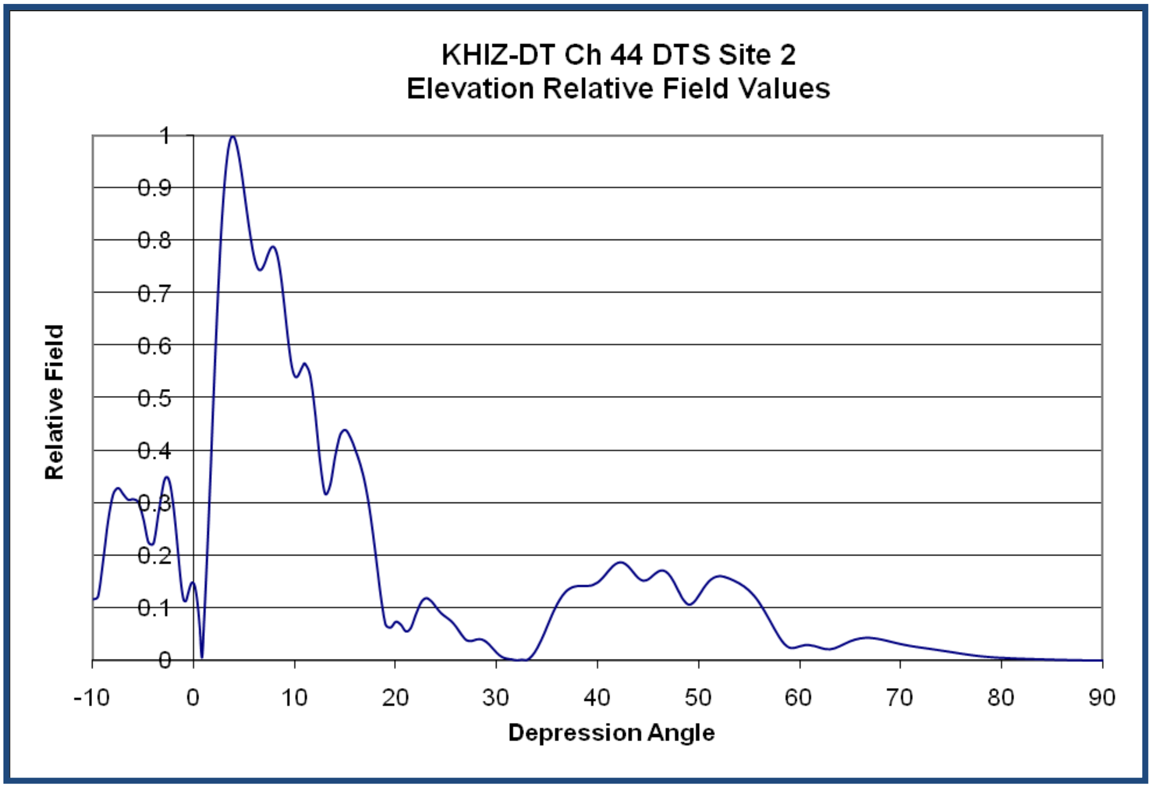

Figure 12a — DTS Site 2 Antenna Elevation Relative Field Values

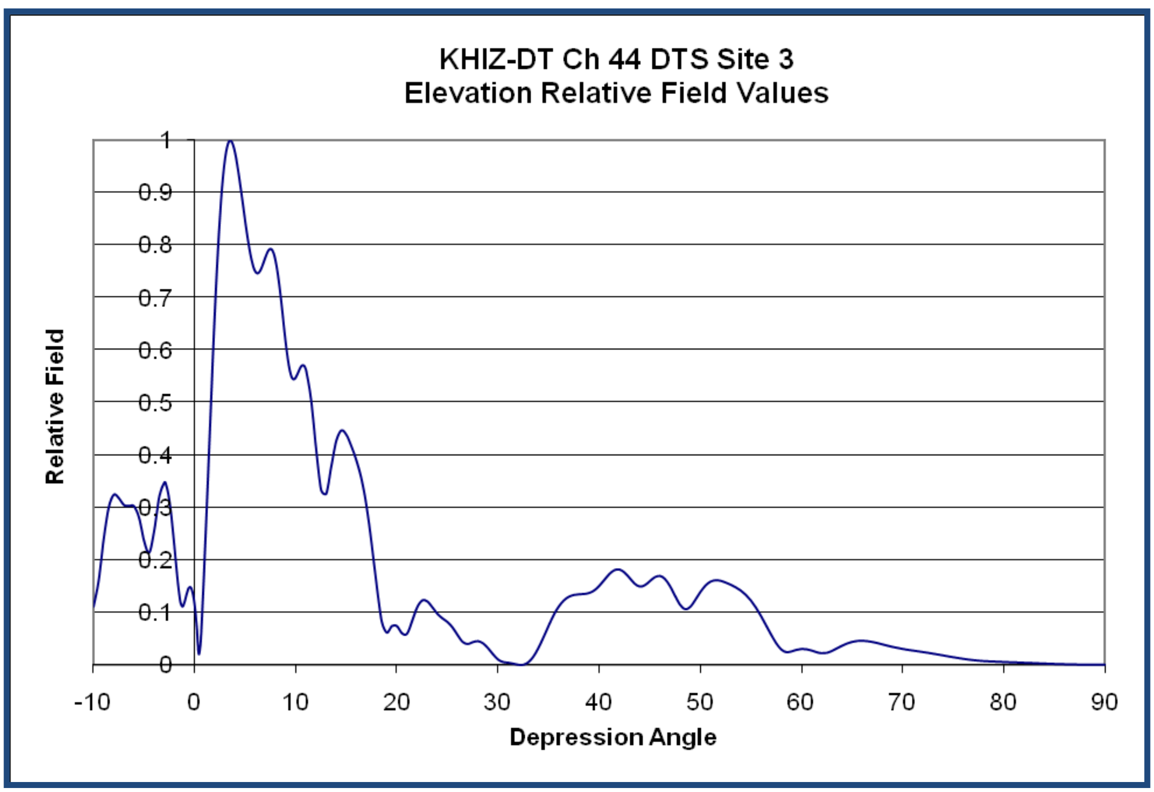

Figure 12b — DTS Site 3 Antenna Elevation Relative Field Values

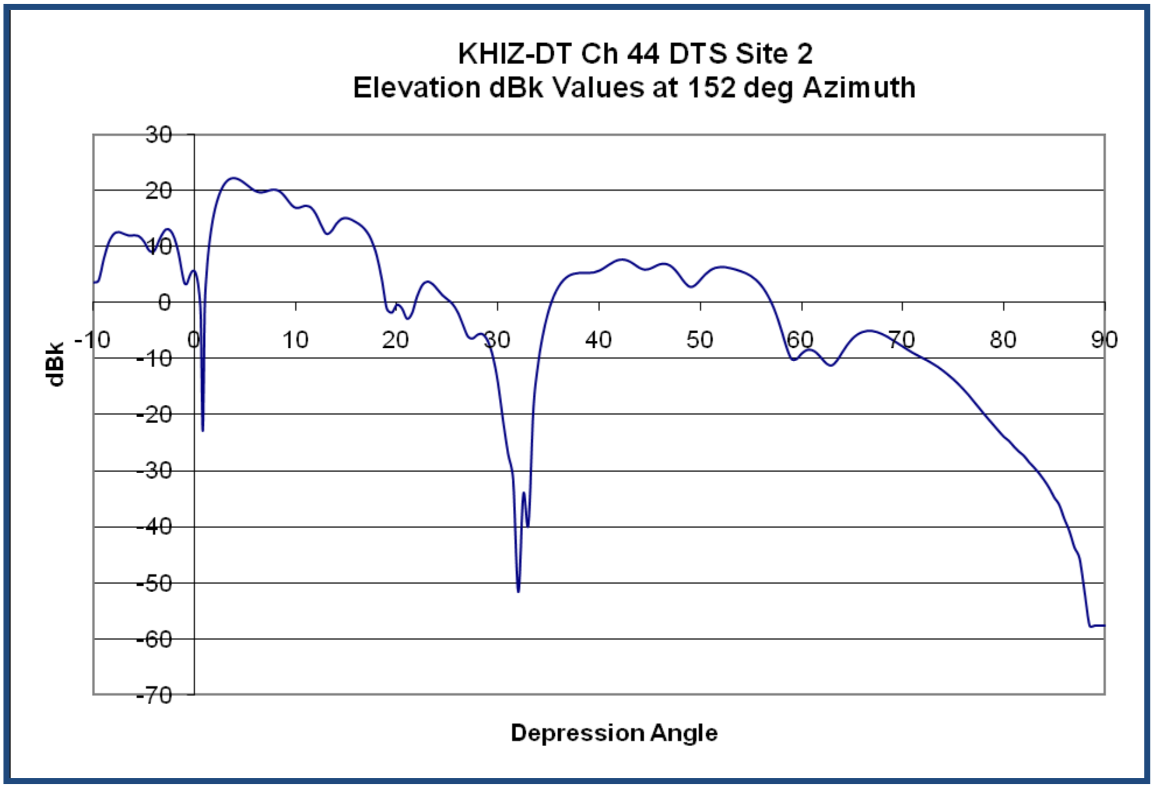

Figure 13a — DTS Site 2 Antenna Elevation dBk Values

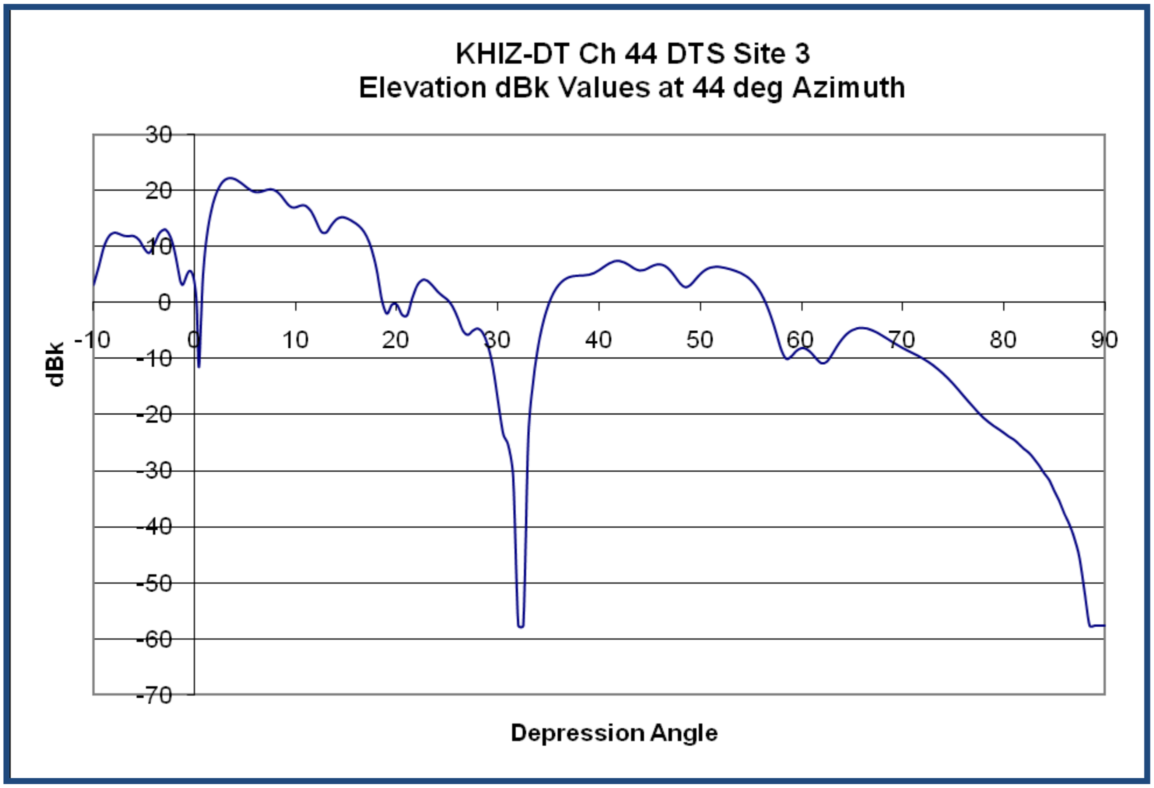

Figure 13b — DTS Site 3 Antenna Elevation dBk Values

Figure 14a — KHIZ-DT Site 2 Elevation Radiation Pattern Tabulated Values

Depression Angle	Relative Field	Effective Radiated Power (dBk)	Depression Angle	Relative Field	Effective Radiated Power (dBk)
-5.0	0.270	10.904	2	0.670	18.809
-4.5	0.225	9.338	9.5	0.586	17.647
-4.0	0.223	9.260	10.0	0.542	16.965
-3.5	0.281	11.264	10.5	0.550	17.094
-3.0	0.338	12.873	11.0	0.566	17.348
-2.5	0.344	13.027	11.5	0.545	17.019
-2.0	0.290	11.538	12.0	0.475	15.815
-1.5	0.192	7.886	12.5	0.379	13.869
-1.0	0.115	3.470	13.0	0.318	12.332
-0.5	0.133	4.721	13.5	0.334	12.764
0.0	0.147	5.609	14.0	0.390	14.099
0.5	0.080	0.034	14.5	0.430	14.964
1.0	0.070	-0.787	15.0	0.440	15.152
1.5	0.287	11.311	15.5	0.426	14.865
2.0	0.525	16.695	16.0	0.402	14.360
2.5	0.741	19.673	16.5	0.373	13.711
3.0	0.901	21.385	17.0	0.333	12.741
3.5	0.984	22.142	17.5	0.276	11.105
3.8	1.000	22.287	18.0	0.202	8.411
4.0	0.997	22.264	18.5	0.125	4.204
4.5	0.957	21.907	19.0	0.068	-1.050
5.0	0.892	21.292	19.5	0.063	-1.754
5.5	0.822	20.581	20.0	0.074	-0.364
6.0	0.767	19.982	20.5	0.068	-1.012
6.5	0.745	19.733	21.0	0.055	-2.859
7.0	0.757	19.865	21.5	0.062	-1.838
7.5	0.782	20.147	22.0	0.088	1.206
8.0	0.787	20.207	22.5	0.110	3.146
8.5	0.748	19.760			

Notes: Derived from data supplied by manufacturer. Complete data set available upon request.

Does not show the effects of mechanical beam tilt, which are included only in the file uploaded within Form 301 on FCC Electronic Filing System