coverage of the station's entire replication service area such that every location within that area is within the PNLC of at least one DTS transmitter, that require service to the station's entire community of license with a City Grade (noise limited +7 dB) signal, that limit acceptable new interference to other stations to a maximum of 0.5 percent (the same as for single-transmitter operations), and that permit the contours of the several transmitters in a DTS network to extend beyond the authorized contour by a minimal amount as necessary to provide service within the authorized contour. The DTS R&O also includes provisions for a Table of Distances alternative that allow the hypothetically maximized service area to equal the service area of the station having the largest service area in the market, as provided in §73.622(f)(5), and that permit the relocation of the station's reference point under certain conditions. Under the DTS rules, the interference determination is based on interference occurring to a neighboring station in a study cell using root-sum-squared (RSS) aggregation of the field strengths of the signals from the several transmitters in the DTS network. All of these precepts have been followed in the design and evaluation of the proposed DTS network.

This Technical Statement has sections treating Transmitter Sites, Facilities, Largest In Market Calculation, Reference Point Relocation and Service Areas, Principal Community Coverage, New Service, Interference Analyses, Considerations Regarding Class A Stations, Border Issues, Environmental Impact/Radio Frequency Radiation, and Notifications. Interference tables appear in line with the text; all other tables and figures appear at the end of this document. While the Commission has used the abbreviation DTS to identify Distributed Transmission Systems; the term DTx, as used by the ATSC, also is used herein to discuss various aspects of Distributed Transmission beyond the system per se.

Transmitter Sites

There are three transmitter sites proposed – the existing "main" site at Snow Peak (DTS Site 1 on the Form 301 application), a new gap-filler site at La Habra Heights (DTS Site 2), and a new gap-filler site at Quartzite Mtn. Their locations are shown on the map in Figure 2. The main, Snow Peak site is located at the reference point for KVMD established in the Appendix B DTV Table of Allotments.[2] It is an established communications site north-northeast of Banning, CA, and is the site from which the station has operated since it began digital transmission. It does now and will continue to provide service to the principal community of Twentynine Palms, CA. It is the site at which KVMD currently is licensed to operate.

The first new transmitter location involves a site previously used by another full-service television broadcaster (KOCE). The site at La Habra Heights serves the Orange Country region and benefits from being in line between Orange County and the antenna farm complex at Mt. Wilson and Mt. Harvard, at which site transmitters for almost all other full-service television stations in the Los Angeles market are situated. This allows receiving antennas in Orange Country aimed at the Mt. Wilson/Mt. Harvard transmitters also to receive signals from La Habra Heights.

The second new transmitter location involves the site used by the one full-service television broadcaster that currently provides signals regularly receivable in the communities of the High Desert (KHIZ). Signals from the site at Quartzite Mtn. reach communities such as Hesperia, Lancaster, Palmdale, and Victorville, all of which are blocked by the San Gabriel Mountains from signals emanating from the Mt Wilson and Mt Harvard sites that serve the rest of the Los Angeles market in which they are located.

Facilities

The facilities requested in this application include continued operation at 150 kW ERP at a height above average terrain of 780 meters at the Snow Peak site, operation at 350 kW ERP at 333 meters HAAT at La Habra Heights, and operation at 356 kW at 576 meters HAAT at Quartzite Mtn. The currently authorized facility at the Snow Peak site meets the requirements of §73.622(f)(8)(ii), as it does not exceed the power allowable at its HAAT, as determined using the formula provided in the rule section. Similarly, 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

[2] 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).

facilities specified by the table in §73.622(f)(8)(i) of the Commission's Rules. The basic characteristics of each of the transmitters proposed in the KVMD DTS network are given in Figures 1a, 1b, and 1c at the end of this Statement 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 KVMD DTS network. The Snow Peak (DTS Site 1) antenna is a cardioid, end-fed, slotted coaxial design with characteristics that originally were primarily intended to provide interference protection to the other station in the market with which KVMD shared Digital Channel 23. Since that protection no longer is required, as a result of KTBN being allotted to another digital channel, it is proposed to rotate the existing antenna better to serve the area to the west of the transmitter site, but east of the Santiago Peak ridge, in which the station's signal currently is weaker than it needs to be. It is proposed to rotate the axis of symmetry of the antenna from 100 degrees to 180 degrees. The result will be to move the null in the back of the antenna pattern from roughly west to north from the transmitter site. A further result will be a reduction in the distance to the PNLC toward the north and northeast of the transmitter site, producing consequent loss areas. As discussed in detail in the section below on Reference Point Relocation and Service Areas, there are no people residing in the loss areas who are predicted to receive service from the current KVMD facility, and, thus, there will be no loss of service from the proposed reorientation of the Snow Peak antenna.

The antenna design at the La Habra Heights site (DTS Site 2) will be a panel array, using broadband panels and a corporate feed. It will consist of a total of twelve panels in a single column and will have a single main lobe in its azimuth pattern. Panel offsets will be used to reduce the radiation from the back of the antenna array, both to limit the location of the contour from the La Habra Heights transmitter and to provide interference protection to an adjacent-channel station. In addition, a significant amount of electrical beam tilt will be used, with a sharp cut-off of the radiation above the main beam to help control the extent of signal projection from the antenna, to permit better control of interference to the adjacent-channel station and within the DTS network.

The antenna design at the Quartzite Mtn. site (DTS Site 3) will be a cavity-slot panel array, using medium-broadband, double-height (i.e., two-wavelength) panels with parasitic radiators and a corporate feed. It will consist of a total of eight panels in a single column and will have a single main lobe in its azimuth pattern. A significant amount of electrical beam tilt will be used, with a sharp cut-off of the radiation above the main beam to help control the extent of signal projection from the antenna.

A plot of the proposed PNLCs[3] of the trio of transmitters is provided in Figure 2, where the proposed Site 1 contour is in orange, the proposed Site 2 contour is in brown, and the proposed Site 3 contour is in purple. In its current configuration, the main, Snow Peak transmitter facility authorized by the existing license (herein, DTS Site 1) already covers the entire authorized service area of the station;[4] thus, the provisions of §73.626(f)(1) would be met by that facility alone. Since it is proposed to rotate the Snow Peak antenna better to serve populated areas, thereby creating some small loss areas in places in which there is no current service, it is believed that the provisions of §73.626(f)(1) still would be met by the Snow Peak facility alone. This is discussed in greater detail in the section below on Largest In Market Calculation and Service Areas. By virtue of the overlap of the contours of the transmitters, they are contiguous, thereby meeting the requirements of §73.626(f)(3). Also shown in Figure 2, in blue, is the 48 dBu contour of the DTS Site 1 facility, which can be seen to encompass the entire community of Twentynine Palms, CA. Nevertheless, some amount of obstruction exists over part of Twentynine Palms due to local clutter from the hills that surround Twentynine Palms, which clutter tends to block one part of the city or another depending upon the transmission site selected. A fuller discussion of this matter is included in the section below on Principal Community Coverage. All three transmitters in the proposed DTS network are located within the KVMD "Largest Station" Alternative to the Table of Distances area, consequently meeting the requirements of §73.626(f)(6).

[3] To account for the dipole correction factor, the PNLCs are plotted at 39.7 dBu, with service statistics of F(50,90).

[4] 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."

It is proposed to rotate the currently-operating DTS Site 1 (Snow Peak) antenna to place the center of its cardioid azimuth pattern at 180 degrees true. Its characteristics and proposed orientation are fully described in Figure 1a. Elevation power gain of the antenna is 25.00 (13.98 dBd) at the vertical beam maximum (0.75 degree below horizontal),[5] 16.83 (12.26 dBd) in the horizontal plane, and 24.95 (13.97 dBd) at 0.773 degree below horizontal, the average depression angle to the radio horizon (computed at 1-degree azimuth intervals). The azimuth power gain is 1.52 (1.82 dB), yielding a total power gain in the main beam of 38.00 (15.80 dBd), in the horizontal plane of 25.61 (14.08 dBd), and toward the average radio horizon of 37.92 (15.79 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 (0.75 degree depression), is 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 proposed DTS Site 2 (La Habra Heights) antenna has its main beam oriented at a bearing of 149 degrees and at a depression angle of 1.4 degrees. Its characteristics and orientation are fully described in Figure 1b.[6] Because of panel offset positioning used in the antenna, its elevation pattern varies with azimuth. Therefore, complete elevation data

[5] In the process of preparing the current application, it was discovered that the installed antenna has an electrical beam tilt of 0.75 degrees, rather than the 0.5-degree beam tilt indicated in the station's license and in the applications for that license and the construction permit that underlies it. The model number shown in the construction permit and license applications also reflects this error, as do the elevation pattern charts provided with the license application. The current application has the correct data for the actual antenna.

[6] Note that, due to the variation of the elevation pattern with azimuth, a rotation of the antenna physical axis of 151 degrees is required to achieve the results described.

for the antenna for DTS Site 2 is being supplied through a complex pattern data file input to the CDBS Electronic Filing System. The azimuth pattern plots supplied in this Technical Statement are for reference only and are at the depression angle of the main beam of the antenna (i.e., at 1.4 degrees depression). Consequently, the azimuth patterns and data herein do not take account of the varying electrical beam tilt with azimuth, the effect of which is reflected wholly within the uploaded elevation data file and only there.

The proposed DTS Site 3 (Quartzite Mountain) antenna has its main beam oriented at a bearing of 263 degrees and at a depression angle of 2.9 degrees. Its characteristics and orientation are fully described in Figure 1c.[7] Because of mechanical beam tilt used in the antenna, its elevation pattern varies with azimuth. Therefore, complete elevation data for the antenna for DTS Site 3 is being supplied through a complex pattern data file input to the CDBS Electronic Filing System. The azimuth pattern plots supplied in this Technical Statement are for reference only and are at the depression angle of the main beam of the antenna (i.e., at 2.9 degrees depression). Consequently, the azimuth patterns and data herein do not take account of the varying beam tilt with azimuth, the effect of which is reflected wholly within the uploaded elevation data file and only there.

It should be noted that azimuth pattern relative field data and the azimuth rotation values for DTS Sites 2 and 3 are not supplied in the online Form 301-DTV application, although the antenna type is set to "Directional." To accomplish the correct indication of directionality while providing complete antenna pattern characteristics only through the elevation pattern data, the azimuth relative field values in the on line form all have been set to unity. This is because, in applications previously filed for other stations, it was determined that the online filing of azimuth data interfered with the correct determination of the orientation and amplitude characteristics of the pattern from the complex elevation pattern data file in the Commission's processing software. The antenna, however, is directional, with the alternate settings being required to make the Commission's input processing software correctly represent the data that describes the antenna. It also should be noted that, once the Commission's DTS processing software is complete and can

[7] Note that, due to the variation of the elevation pattern with azimuth, a rotation of the antenna physical axis of 263 degrees prior to application of mechanical beam tilt is required to achieve the results described.

handle both the azimuth rotation and mechanical beam tilt of complex patterns, then such alternate settings as those described herein may not be required for later filings by other stations.

The essential elevation pattern design of the antenna for DTS Site 2 is somewhat unusual. It includes a main beam at a depression angle of 1.4 degrees, with a rapid fall-off of relative field values above the main beam to a deep null at a depression angle of -1.4 degrees. The null serves two purposes: it helps to control the location of the contour while permitting stronger field strengths to be delivered within the service area, and it helps in controlling interference to other stations. The elevation pattern design also includes a relatively broad peak and significant power levels to depression angles of approximately 15 degrees, thereby providing strong signals to the areas below the ridge on which the gap-filler transmitter is situated.

Elevation power gain of the antenna design for DTS Site 2, at the azimuth of beam maximum (149 degrees), is 10.00 (10.00 dBd) at the beam maximum (1.4 degrees below horizontal), less than 0.0028 (–25.57 dBd) at the null above the main beam (1.4 degrees above horizontal), and 0.465 (–3.33 dBd) in the horizontal plane. The azimuth power gain, at the depression angle of beam maximum (1.4 degrees) is 6.70 (8.26 dB). The total power gain in the main beam is 59.70 (17.76 dBd), and the maximum power gain in the horizontal plane is 34.38 (15.35 dBd) at a bearing of 162.5 degrees. Because of the electrical beam tilt variation with azimuth of this antenna, it is not possible to sum the azimuth and elevation gains to obtain the overall gain, and the effective radiated power toward the average radio horizon is an inappropriate parameter for this antenna and therefore is not provided.

A plot of the DTS Site 2 antenna azimuthal radiation pattern in relative field values, at the depression angle having maximum field (1.4 degrees depression), is included as Figure 9. The azimuthal power pattern expressed in decibels relative to 1 kW (dBk), at the depression angle having maximum power (also 1.4 degrees depression), is plotted in Figure 10. The tabulated azimuthal field and power values are given in Figure 11. The elevation radiation pattern in relative field values, in the azimuthal direction having maximum field (149 degrees), is included as Figure 12. The elevation power pattern expressed in decibels relative to 1 kW (dBk), in the azimuthal direction having maximum power (also 149 degrees), is plotted in Figure 13. The tabulated elevation field and power values are given in Figure 14. The elevation pattern data for the DTS Site 2 antenna has been uploaded to the CDBS Electronic Filing System (EFS) web site in complex array form in Office Open XML format, with the first column containing depression angle values and the first row containing azimuth values for each column.

The elevation pattern design of the antenna for DTS Site 3 also is somewhat unusual. It includes a main beam at a depression angle of 2.9 degrees, with a rapid fall-off of relative field values above the main beam to a deep null at a depression angle of 0.4 degrees. The null primarily serves to control the location of the contour while permitting stronger field strengths to be delivered within the service area. Mild mechanical beam tilt of 0.125-degree downward toward a bearing of 315 degrees will be applied to this antenna.

Elevation power gain of the antenna design for DTS Site 3, at the azimuth of beam maximum (263 degrees), is 20.37 (13.09 dBd) at the beam maximum (2.9 degrees below horizontal), less than 0.00004 (–44.65 dBd) at the null above the main beam (0.4 degrees below horizontal), and 0.0185 (–17.32 dBd) in the horizontal plane. The azimuth power gain, at the depression angle of beam maximum (2.9 degrees) is 5.70 (7.56 dB). The total power gain in the main beam is 116.14 (20.65 dBd), and the maximum power gain in the horizontal plane is 2.15 (3.33 dBd) at a bearing of 263 degrees. Because of the beam tilt variation with azimuth due to the mechanical beam tilt of this antenna, the effective radiated power toward the average radio horizon is an inappropriate parameter for this antenna and therefore is not provided.

A plot of the DTS Site 2 antenna azimuthal radiation pattern in relative field values, at the depression angle having maximum field (2.9 degrees depression), is included as Figure 15. The azimuthal power pattern expressed in decibels relative to 1 kW (dBk), at the depression angle having maximum power (also 2.9 degrees depression), is plotted in Figure 16. The tabulated azimuthal field and power values are given in Figure 17. The elevation radiation pattern in relative field values, in the azimuthal direction having maximum field (263 degrees), is included as Figure 18. The elevation power pattern expressed in decibels relative to 1 kW (dBk), in the azimuthal direction having maximum power (also 263 degrees), is plotted in Figure 19. The tabulated elevation field and power values are given in Figure 20. The elevation pattern data for the DTS Site 3 antenna has been uploaded to the CDBS Electronic Filing System (EFS) web site in complex array form in Office Open XML format, with the first column containing depression angle values and the first row containing azimuth values for each column.

All of the transmitters to be used in the KVMD 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

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.[8] In ¶35 "Largest Station" Alternative, it states, "As an alternative to the Table of Distances Approach for determining the hypothetically maximized service area, full-power stations may use the 'largest station' provision in section 73.622(f)(5) of the rules."[9]

To implement the provisions of §73.622(f)(5), a method has been followed to determine the radius of a circle that matches the area contained within the contour of the largest station in the same market as that of the applicant. The market has been defined by the Commission as the DMA in which a station is located.[10] KVMD is located in the Los Angeles DMA. As noted in the First DTV Periodic Report and Order, "the geographical

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[8] DTS R&O, ¶35.

[9] *Digital Television Distributed Transmission System Technologies*, Report and Order, MB Docket No. 05-312, FCC 08-256, released November 7, 2008, at ¶35.

[10] See *Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television*, MM Docket No. 00-39, Report and Order, 16 FCC Rcd 5946, 5973-4, ¶¶73-74 (2001) ("First DTV Periodic Report and Order").

Figure 1b — Technical Specifications — Proposed KVMD-DTS Facility Channel 23 — Twentynine Palms, CA — Site 2: La Habra Heights

Frequency

Channel	23
Frequency Band	524 – 530 MHz
Center Frequency	527 MHz

Location

Site	La Habra Heights, CA
Geographic Coordinates (NAD27)	33° 58’ 18.95” N 117° 56’ 56.77” W
Tower Registration (FAA Study Number)	1013567 (71-WE-382-OE)

Elevation

Elevation of site above mean sea level	394.7 m
Overall height of tower above site elevation	77.4 m
Overall height of tower above mean sea level	472.1 m
Height of antenna radiation center above site elevation	69.6 m
Elevation of average terrain (45-degree-spaced radials, 3.2-16.1 km)	131.4 m
Height of antenna radiation center above mean sea level	464.3 m
Height of antenna radiation center above average terrain (HAAT)	332.9m

Antenna

Manufacturer	Radio Frequency Systems
Model	PHP5S-12A
Description	Side-Mounted UHF Panel
Orientation (physical rotation around vertical axis)	151° true
Electrical beam tilt	1.4°
Mechanical beam tilt	None
Polarization	Horizontal
Gain (peak of beam – 149° azimuth, 1.4° depression)	59.70 (17.76 dBd)
Gain (in horizontal plane – 162.5° azimuth, 0° depression)	34.38 (15.35 dBd)

Power

Effective radiated power (ERP) (main beam – 1.4° depression)	350.0 kW
Effective radiated power (ERP) (maximum in horizontal plane)	201.6 kW

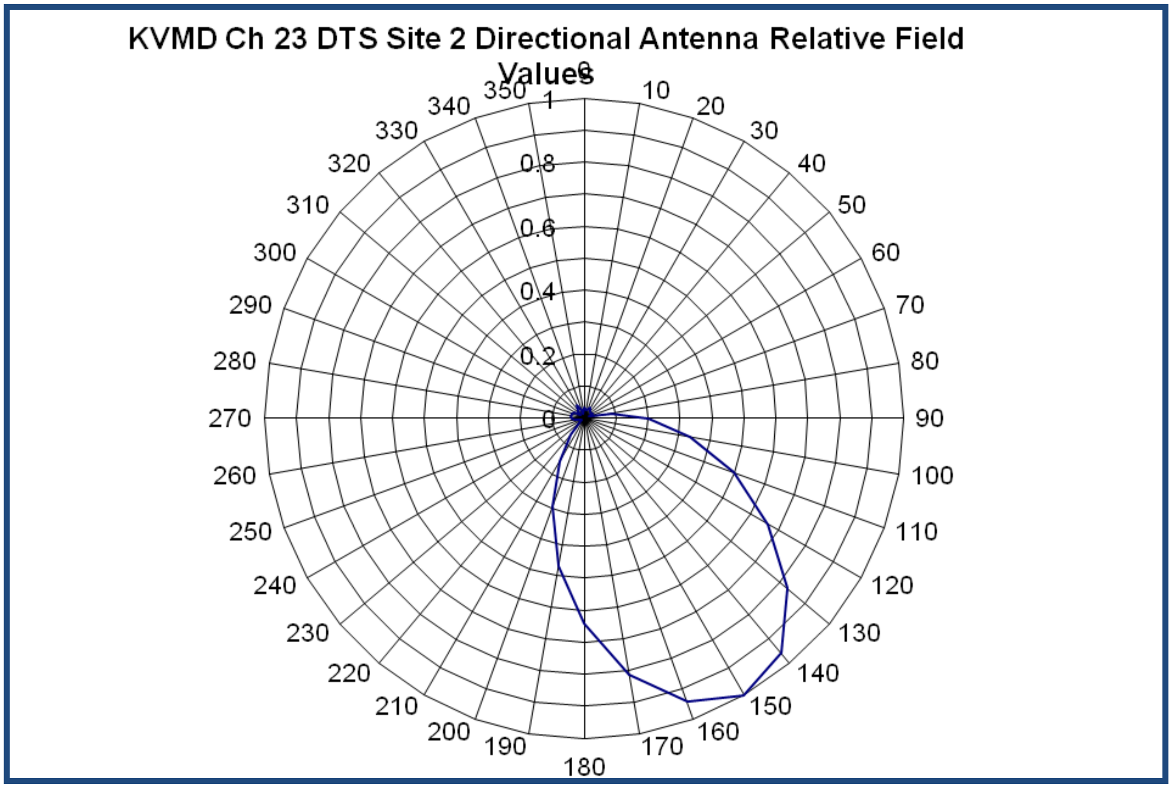

Figure 9 — DTS Site 2 Antenna Azimuth Relative Field Values

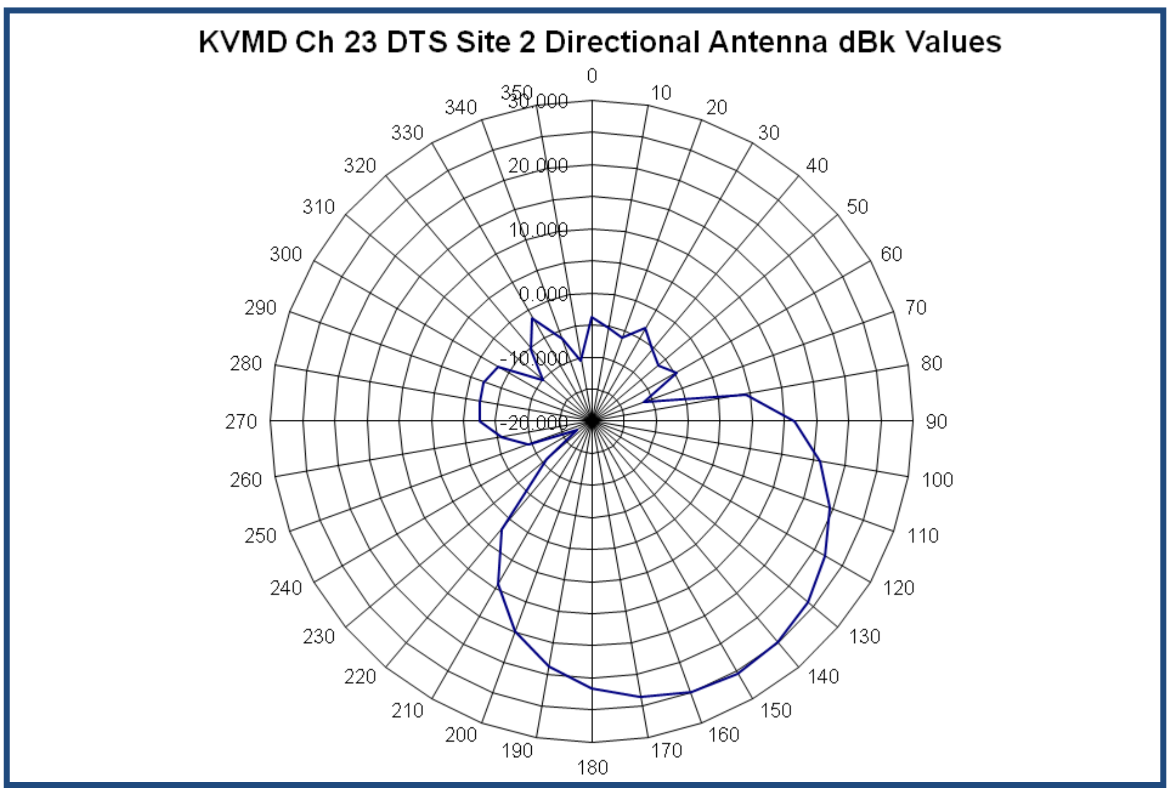

Figure 10 — DTS Site 2 Antenna Azimuth dBk Values

Figure 11— KVMD Site 2 Azimuthal Radiation Pattern Tabulated Values

Azimuth	Relative Field	Effective Radiated Power (dBk)	Azimuth	Relative Field	Effective Radiated Power (dBk)
0	0.034	-3.828	180	0.642	21.590
10	0.029	-5.192	190	0.468	18.853
20	0.026	-6.193	200	0.295	14.828
30	0.037	-3.313	210	0.157	9.364
40	0.028	-5.493	220	0.067	1.975
50	0.025	-6.497	230	0.015	-10.809
60	0.031	-4.873	min 236	0.005	-21.159
min 68	0.012	-13.159	240	0.007	-17.293
70	0.014	-11.453	250	0.018	-9.502
80	0.087	4.271	260	0.028	-5.773
90	0.200	11.453	270	0.040	-2.475
100	0.336	15.978	280	0.041	-2.219
110	0.499	19.397	290	0.042	-2.136
120	0.665	21.897	300	0.038	-3.056
130	0.829	23.808	310	0.017	-10.157
140	0.958	25.064	320	0.029	-5.341
max 149	1.000	25.441	330	0.045	-1.514
150	1.000	25.438	340	0.026	-6.429
160	0.943	24.935	350	0.016	-10.477
170	0.813	23.646			

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

Values taken from slice through three-dimensional pattern at 1.4 degrees depression. Does not show the effects of variation of the elevation pattern with azimuth, which are included only in the file uploaded within Form 301 on FCC Electronic Filing System.

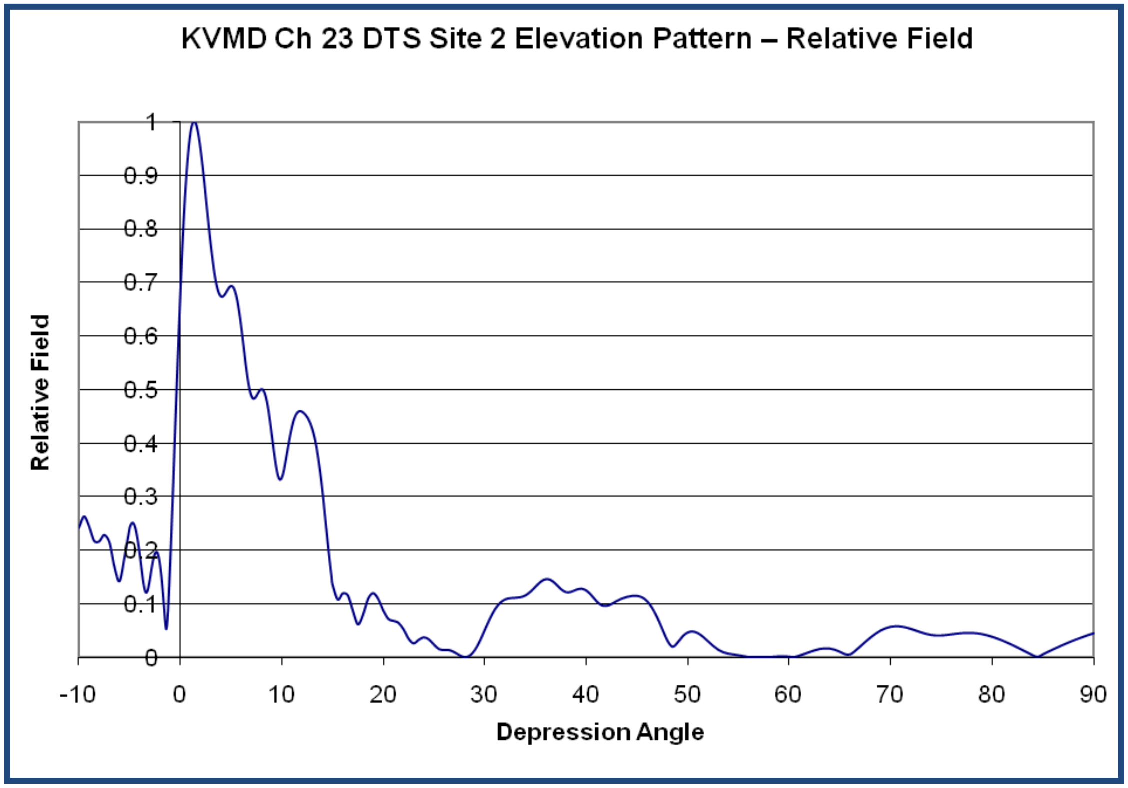

Figure 12 — DTS Site 2 Antenna Elevation Relative Field Values

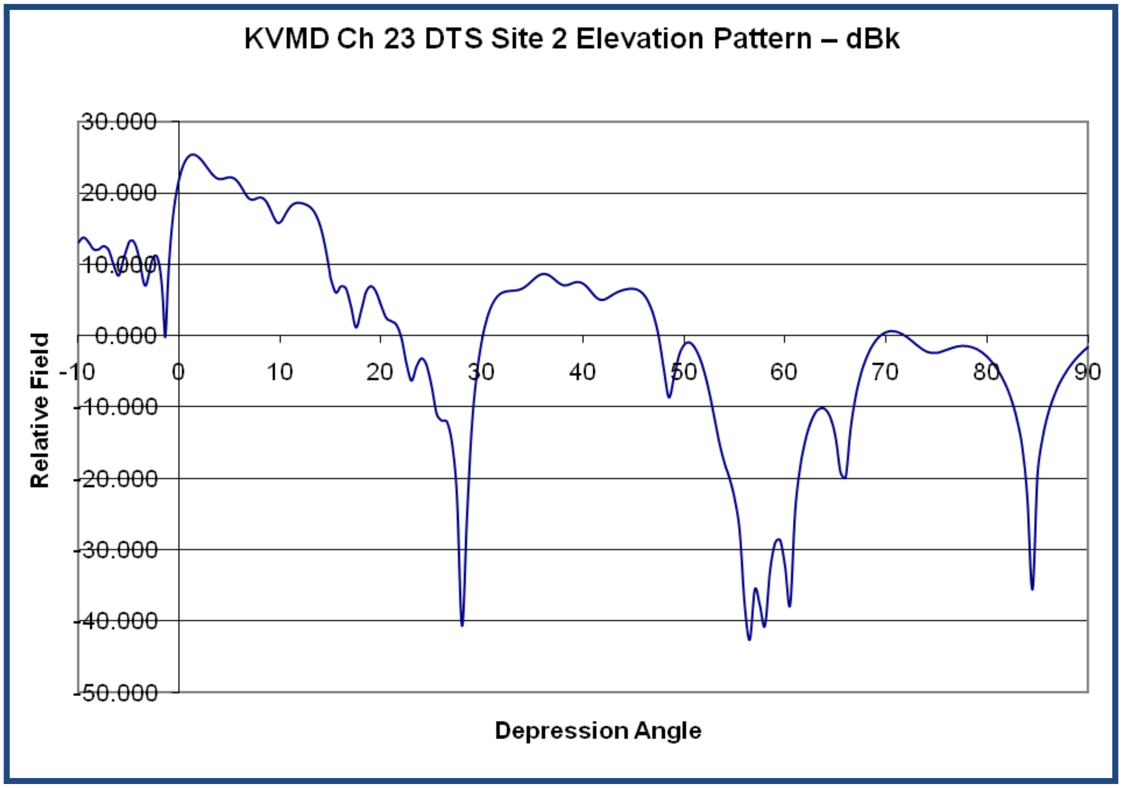

Figure 13 — DTS Site 2 Antenna Elevation dBk Values

Figure 14 — KVMD 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	0.242	13.106	9.0	0.416	17.814
-4.5	0.245	13.224	9.5	0.344	16.170
-4.0	0.190	11.029	10.0	0.336	15.957
-3.5	0.125	7.386	10.5	0.386	17.181
-3.0	0.147	8.793	11.0	0.431	18.130
-2.5	0.195	11.259	11.5	0.456	18.626
-2.0	0.172	10.126	12.0	0.458	18.662
-1.5	0.059	0.833	12.5	0.448	18.464
-1.0	0.179	10.517	13.0	0.426	18.023
-0.5	0.459	18.654	13.5	0.382	17.071
0.0	0.682	22.110	14.0	0.309	15.237
0.5	0.888	24.410	14.5	0.217	12.174
1.0	0.980	25.265	15.0	0.136	8.086
1.4	1.000	25.441	15.5	0.108	6.101
1.5	0.994	25.390	16.0	0.119	6.973
2.0	0.946	24.957	16.5	0.116	6.692
2.5	0.849	24.021	17.0	0.087	4.201
3.0	0.768	23.149	17.5	0.062	1.218
3.5	0.696	22.295	18.0	0.080	3.502
4.0	0.673	22.006	18.5	0.109	6.213
4.5	0.683	22.126	19.0	0.120	7.010
5.0	0.693	22.255	19.5	0.109	6.165
5.5	0.671	21.968	20.0	0.087	4.251
6.0	0.615	21.222	20.5	0.072	2.563
6.5	0.530	19.928	21.0	0.068	2.104
7.0	0.488	19.200	21.5	0.064	1.605
7.5	0.490	19.237	22.0	0.052	-0.256
8.0	0.501	19.429	22.5	0.034	-3.853
8.5	0.474	18.957	23.0	0.026	-6.227

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

Values taken from slice through three-dimensional pattern at 149 degrees azimuth. Does not show the effects of variation of the elevation pattern with azimuth, which are included only in the file uploaded within Form 301 on FCC Electronic Filing System.