

**DTV Utah, LLP  
Farnsworth Peak Telecommunications Site  
Salt Lake and Tooele Counties, Utah**

**Study of RF Exposure Conditions**

February 21, 2003

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## **DTV Utah, LLP • Farnsworth Peak, Utah RF Exposure Conditions**

### **Statement of Hammett & Edison, Inc., Consulting Engineers**

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by DTV Utah, LLP, to determine by calculation and field measurement the radiofrequency electromagnetic power densities at the Farnsworth Peak telecommunications site and to provide recommendations concerning mitigation, as necessary, to achieve compliance with FCC guidelines.

### **Prevailing Exposure Standards**

The U.S. Congress requires that the Federal Communications Commission ("FCC") evaluate its actions for possible significant impact on the environment. In Docket 93-62, effective October 15, 1997, the FCC adopted the human exposure limits for field strength and power density recommended in Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements ("NCRP"). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent Institute of Electrical and Electronics Engineers ("IEEE") Standard C95.1-1999, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," includes nearly identical exposure limits. A summary of the FCC's exposure limits is shown in Figure 1. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

### **Background**

Farnsworth Peak is a controlled-access telecommunications site located about 29 kilometers southwest of Salt Lake City, Utah. Vehicular access is generally possible from the east during the late-spring through fall months, but requires traversing a private toll road and passing through at least one locked gate controlled by Kennecott Copper. Standard RFR warning signs have been posted at the gate. Access by hikers and equestrians from the west is also possible, though difficult, through public lands, but requires traversing a substantial distance over very steep and rugged terrain.

The high-power broadcast facilities currently operating from the site include 13 FM Stations,<sup>1</sup> three NTSC television stations,<sup>2</sup> and eight Digital television ("DTV") stations.<sup>3</sup> The site includes numerous

<sup>1</sup> Stations KRCL(FM), 90.9 MHz; KUBL-FM, 93.3 MHz; KXRK(FM), 96.3 MHz; KISN-FM, 97.1 MHz; KBZN(FM), 97.9 MHz; KSFI(FM), 100.3 MHz; KBER(FM), 101.1 MHz; KKAT(FM), 101.9 MHz; KQMB(FM), 102.7 MHz; KRSP-FM, 103.5 MHz; KSOP-FM, 104.3 MHz; KCPX(FM), 105.7 MHz; and KOSY-FM, 106.5 MHz, licensed variously to Centerville, Midvale, Ogden, Salt Lake City, and Spanish Fork.

<sup>2</sup> Stations KSL-TV, Channel 5, licensed to Salt Lake City, and KPNZ(TV), Channel 24 and KUWB(TV), Channel 30, both licensed to Ogden.



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low-power two-way and other non-broadcast communications facilities; except at locations within a few feet of the associated transmitting antennas, those facilities do not add significantly to RF exposure conditions at the site. A photograph of the site identifying the major (broadcast) towers is shown in Figure 2. A summary of the technical specifications for each of the present facilities is given in Figure 3.

Station KULC-DT was not operating during the ground-level survey, but has been included in the on-tower calculations. Station KJZZ-DT was operating at reduced power (71% of authorized) during the ground-level survey, but is assumed to operate at full power for the on-tower calculations. Three lower power facilities (FM Booster Station KUDD-FM4, Class A TV Station KEJT-LP, and ITFS provider Sprint Broadband) also operate from the site and are included in both the ground-level measurements and the on-tower calculations.

In addition, high-power broadcast facilities at the neighboring "Channel 13" site, located about 410 feet south of Farnsworth Peak, are included in both the ground-level measurements and the on-tower calculations. The facilities at that site include TV Station KSTU, Channel N13, and Station KSTU-DT, Channel D28, both licensed to Salt Lake City. Transmitting facilities at the "Little Farnsworth" site, located about 2,290 feet south of Farnsworth Peak, were calculated to contribute less than 5% of their applicable limit at Farnsworth Peak, and so have not been included in the on-tower calculations.

### **Computer Modeling Method**

The FCC provides direction for determining compliance in its Office of Engineering and Technology Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation," dated August 1997. Figure 4A attached describes the calculation methodology for ground-level locations, reflecting the fact that the power level from an energy source decreases with the square of the distance from it (the "inverse square law"). Figure 4B attached describes the calculation methodology for on-tower locations. The conservative nature of these methods for evaluating exposure conditions has been verified by numerous field tests.

### **Ground-Level Measurement Methodology**

A field survey of the radio frequency electromagnetic fields at the Farnsworth Peak site was made on November 11, 2002, with all stations operating from their main transmitting facilities within licensed parameters, except as noted above. Measurements were taken using a Wandel & Goltermann Type EMR-300 Radiation Meter with a Type 25 isotropic electric field probe; this instrument was under

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<sup>3</sup> Stations KUTV-DT, Channel D34; KULC-DT, Channel D36; KSL-DT, Channel D38; KTVX-DT, Channel D40; KUED-DT, Channel D42; KBYU-DT, Channel D44; KJZZ-DT, Channel D46; and KUWB-DT, Channel D48, licensed variously to Ogden, Provo, and Salt Lake City.



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current calibration by the manufacturer. The use of spatial averaging was *not* relied upon to establish compliance with the prevailing standards. The standards, however, do permit the use of whole-body spatial averaging to demonstrate compliance with the power density limits. Spatial averaging typically reduces the measured power density values to about 60% of the peak values,<sup>4</sup> so the measurement method used is conservative.

### Results of Ground-Level Measurements

The results of the measurements are shown graphically in Figure 5. With all stations operating from their normal (main) transmitting facilities, the highest measured power density near ground level was 47% of the occupational limit. Not all locations could be accessed for measurement due to the presence of deep snow, construction equipment, or steep terrain. The areas shown in white in Figure 5 were not measured, but it is believed that none of those locations had power densities exceeding the maximum reported. The power densities associated with the various auxiliary antennas were not measured during this survey.

### Results of Ground-Level Calculations

Because no measurements have been made of the present configuration of auxiliary antennas, calculations were used to determine compliance with the occupational exposure guidelines. All of the FM stations transmit from a single, shared antenna, so it is sometimes necessary for all FM stations to switch, simultaneously, to operation from the respective auxiliary antenna facilities. This configuration (all FM stations operating from auxiliary antennas) was therefore studied for ground-level RFR impacts. It was assumed that access to the area surrounding and east of the Big Delta structure, which is presently marked by warning signs and lights, will not be accessed while the FM stations are operating from the auxiliary antennas. All other ground-level areas of the site are assumed to be subject to worker access, however.

The table below lists the maximum allowable operating powers of certain auxiliary FM facilities in order to achieve calculated compliance with the occupational limits in the accessible areas described above.

Callsign	Frequency	TPO	% of normal	Callsign	Frequency	TPO	% of normal
KXRK	96.3 MHz	2.4 kW	30%	KQMB	102.7 MHz	2.0 kW	25%
KISN	97.1	7.2	90%	KSOP-FM	104.3	0.8	10%
KBER	101.1	5.6	70%	KCPX	105.7	5.6	70%
KKAT	101.9	2.7	45%	KOSY-FM	106.5	4.8	60%

<sup>4</sup> Robert D. Weller and Stanley Salek, "FCC RFR Guidelines: Is Your Facility *Really* in Compliance?" *Proceedings of the NAB Engineering Conference*, 1999.



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Stations not listed in the preceding table may operate at their normal power levels (typically 8 kilowatts TPO, except for KRCL, which normally operates with 0.85 kW TPO into its auxiliary antenna).

### **Results of On-Tower Calculations**

Using technical data listed in Figure 3, on-tower exposure conditions were calculated for each of the major towers at the site. Contributions from the various broadcast facilities were considered in five-foot segments of each tower and the power levels were adjusted to achieve calculated compliance in that segment. Separate power cut-back tables are provided for each of the towers at the site. These tables, contained in Figure 6, detail appropriate power cutbacks to mitigate calculated exposures in excess of the occupational field limits calculated to occur while workers climb the towers. In preparing these tables, every attempt was made to allow all stations to continue operating at some reduced power, but when no backup antenna facility is available, cessation of transmission may be the only option. The tables were developed assuming no use of personal protective RF exposure suits.

### **Conclusion and Recommendations**

In all areas, measured ground level exposure conditions due to the main transmitting facilities located at the site were found to be below 50% of the FCC occupational exposure standard. Provided the site remains a controlled area, no special mitigation measures are necessary with respect to ground-level exposures during normal operation, and the stations operating at the site comply with the FCC standard for occupational exposure conditions at ground level. When the FM stations are operating from auxiliary antennas, access to areas surrounding and east of the Big Delta structure must be restricted, and certain stations must operate at reduced power, as detailed in the table above. Certification of compliance with the FCC guidelines for occupational, on-tower exposures can also be made, so long as it has been ensured that the stations at the site adhere to the specified power cutbacks given in Figure 6 for access above the "Free Height."

A formal RF Safety program should be implemented for personnel whose job functions require on-tower access. This program should include information about current exposure standards, maximum tower access height limits for normal operations (*i.e.*, stations with both main and auxiliary antennas operating into their main antennas at full power), and familiarity with power cutbacks, use of auxiliary antennas, or both, as may be necessary to ensure that access to greater heights is in calculated compliance with FCC guidelines.



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**List of Figures**

In carrying out these engineering studies, the following attached figures were prepared under my direct supervision:

1. Summary of FCC exposure guidelines
2. Photograph of site
3. Technical specifications
4. RFR.GROUND™ and RFR.TOWER™ methodologies
5. Measured RF power densities at ground level
6. Tables of power reductions for tower access.



/s/ Robert D. Weller  
Robert D. Weller, P.E.

February 21, 2003



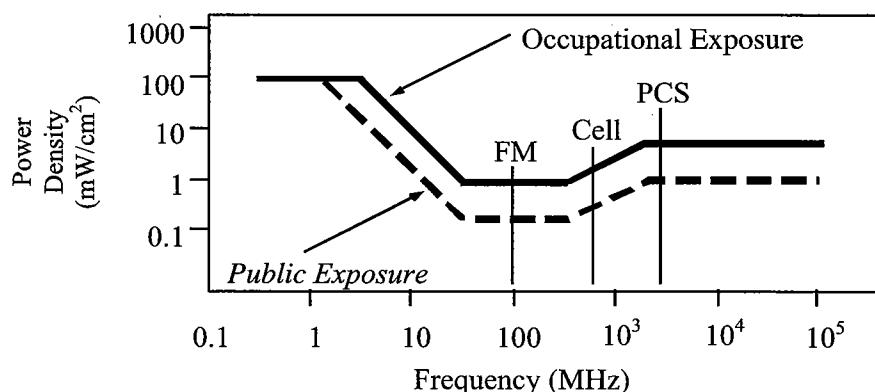
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## FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements, which are nearly identical to the more recent Institute of Electrical and Electronics Engineers Standard C95.1-1999, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:

Frequency Applicable Range (MHz)	Electromagnetic Fields ( <i>f</i> is frequency of emission in MHz)					
	Electric Field Strength (V/m)		Magnetic Field Strength (A/m)		Equivalent Far-Field Power Density (mW/cm <sup>2</sup> )	
0.3 – 1.34	614	<i>614</i>	1.63	<i>1.63</i>	100	<i>100</i>
1.34 – 3.0	614	<i>823.8/f</i>	1.63	<i>2.19/f</i>	100	<i>180/f<sup>2</sup></i>
3.0 – 30	1842/f	<i>823.8/f</i>	4.89/f	<i>2.19/f</i>	900/f <sup>2</sup>	<i>180/f<sup>2</sup></i>
30 – 300	61.4	<i>27.5</i>	0.163	<i>0.0729</i>	1.0	<i>0.2</i>
300 – 1,500	3.54√ <i>f</i>	<i>1.59√f</i>	√ <i>f</i> /106	<i>√f/238</i>	<i>f/300</i>	<i>f/1500</i>
1,500 – 100,000	137	<i>61.4</i>	0.364	<i>0.163</i>	5.0	<i>1.0</i>

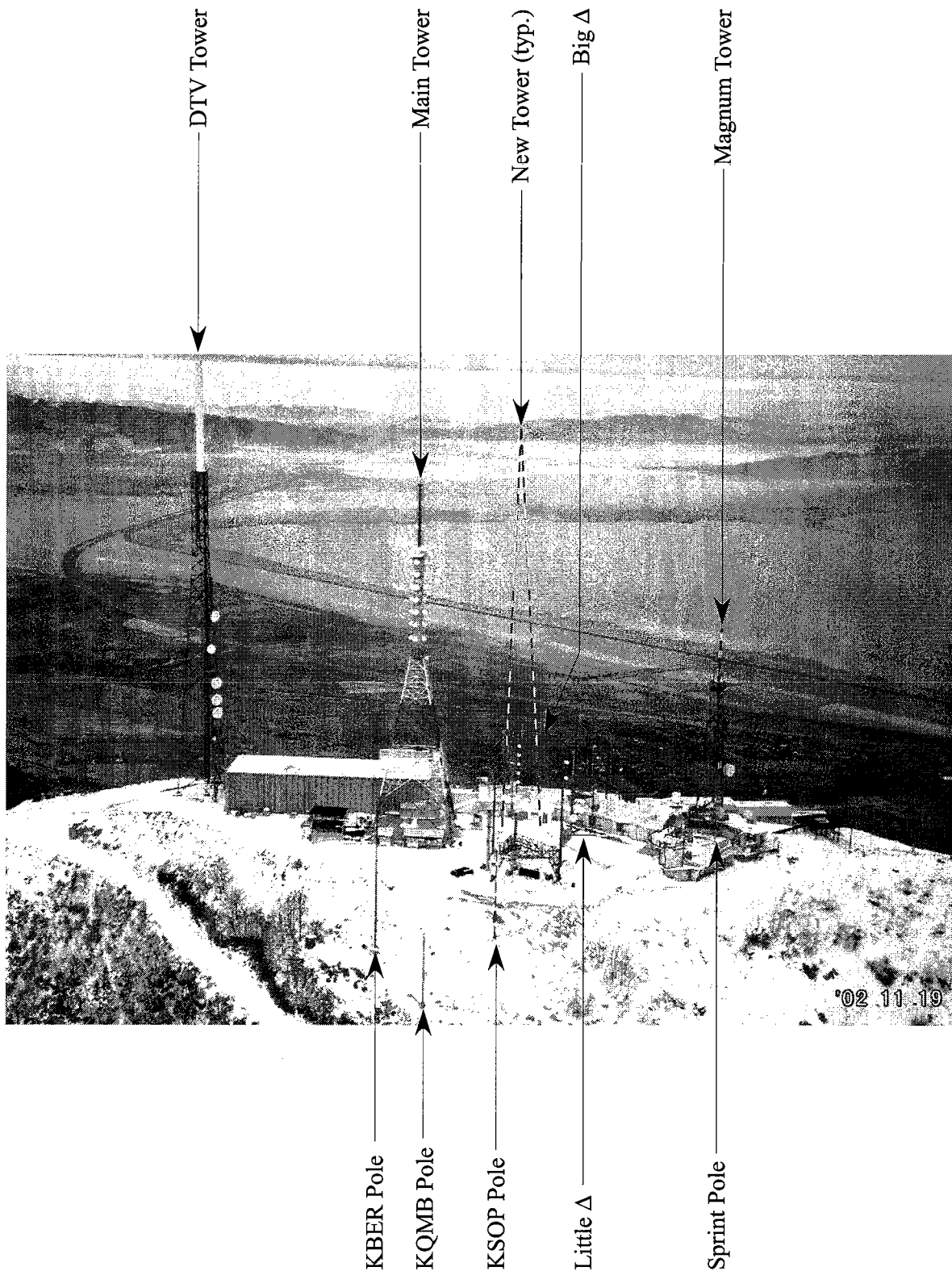


Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.



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Site Photograph, Showing Tower Locations



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Figure 2



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**RF Exposure Conditions**

**Towers at Site**

<u>Tower Name</u>	<u>Base Elevation (above sea level)</u>	<u>Overall Height (above ground)</u>
Main Tower	9,040 ft	239 ft
DTV Tower	9,033	315
Magnum Tower	9,035	144
Big Δ ("Delta")	9,036	80
Little Δ	9,037	42
KSOP Pole	9,006	62
KQMB Pole	8,981	50
KUBL Pole	8,992	97
Ch.13 Tower	8,935	164
Sprint Tower	9,036	80
New Tower	9,037	282



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Figure 3A

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**RF Exposure Conditions**

**Engineering Specifications of Stations Considered**

<u>Callsign</u>	<u>TV Ch. or FM Freq.</u>	<u>Antenna Make/Model</u>	<u>Antenna Effective Height (above ground)</u>	<u>Polarization</u>	<u>Transmitter Power Output</u>	<u>Effective Radiated Power</u>
<b>Main Tower</b>						
KSL-TV	N05	Jampro JAT 3/5D	216 ft	H		33.9 kW
<u>FM Master Antenna</u>		Jampro JAHD-7/4(28)	159	C		<u>327.0</u>
KRCL	90.9					25.0
KUBL-FM	93.3					25.0
KXRK	96.3					25.0
KISN-FM	97.1					25.0
KBZN	97.9					26.0
KSFI	100.3					26.0
KBER	101.1					25.0
KKAT	101.9					25.0
KQMB	102.7					25.0
KRSP-FM	103.5					25.0
KSOP-FM	104.3					25.0
KCPX	105.7					25.0
KOSY-FM	106.5					25.0
<b>DTV Tower</b>						
<u>Upper DTV Antenna</u>		Kathrein K773928	287	H		<u>1,408.0</u>
KUTV-DT	D34					423.0
KSL-DT	D38					546.0
KUED-DT	D42					239.0
KJZZ-DT	D46					200.0
<u>Lower DTV Antenna</u>		Kathrein K773928	255	H		<u>1,221.7</u>
KULC-DT	D36					200.0
KTVX-DT	D40					475.7
KBYU-DT	D44					346.0
KUWB-DT	D48					200.0
<u>NTSC Panel Antenna</u>		Dielectric TUP-T3-12-1	215	H		<u>3,000</u>
KPNZ	N24					1,514
KUWB	N30					1,486

Notes: ERP for main antennas from FCC database. TPO for auxiliary operations from station personnel;  
 ERP for auxiliary operations from TPO and approximate antenna gain.

\* asterisk indicates auxiliary antenna.



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 Figure 3B

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**RF Exposure Conditions**

**Engineering Specifications of Stations Considered**

Callsign	TV Ch. or FM Freq.	Antenna Make/Model	Antenna Effective Height (above ground)	Polarization	Transmitter Power Output	Effective Radiated Power
<b>Magnum Tower</b>						
KSL-TV*	N05	Jampro JAT 3/5DR (3°ebt)	120 ft	H		34.7 kW
KEJT-LP	N50	Andrew ALP16L7-HSNR	70	H	1.0 kW	36.9
K18FJ	N18	Andrew ALP16L2-HSE	82	H	0.85	3.6
KRSP-FM*	103.5	ERI SHPX-1AE	93	C	8.0	3.5
KBZN(FM)*	97.9	Jampro JMPC-4	78	C	8.0	15.2
<b>Big Δ</b>						
KISN-FM*	97.1	(SE Leg) Gates FMC-4	56	H	8.0	15.3
KOSY-FM*	106.5	(SE) ERI SHPX-2E	34	H	8.0	7.3
KSFI*	100.3	(N) Jampro JSCP-4	61	H	8.0	15.3
KCPX*	105.7	(SW) Jampro JMPC-5R-0.8λ	67	H	8.0	15.6
<b>Little Δ</b>						
KXRK*	96.3	Shively 6810-2	33	C	8.0	7.6
<b>KSOP Pole</b>						
KSOP-FM*	104.3	Jampro JSCP-6R (1° ebt)	33	C	8.0	23.3
<b>KQMB Pole</b>						
KQMB*	102.7	Jampro JSCP-4	30	C	8.0	15.2
KRCL*	90.9	Jampro JMPC-1	5	C	0.85	0.40
<b>KUBL Pole</b>						
KUBL-FM*	93.9	Phelps-Dodge CFM-HP4	79	C	8.0	15.3
KBER*	101.1	ERI LPX-1E	51	C	8.0	3.4
KKAT*	101.9	unknown 2-bay	34	C	6.0	5.5
<b>Ch. 13 Tower</b>						
KSTU	N13	Harris TAC-3HD CBR	157	C		112
<b>Sprint Tower</b>						
various	ITFS	Andrew HMD12HO	78	H		14.6
<b>New Tower</b>						
Not yet constructed						

Notes: ERP for main antennas from FCC database. TPO for auxiliary operations from station personnel;  
ERP for auxiliary operations from TPO and approximate antenna gain.

\* asterisk indicates auxiliary antenna.



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Figure 3C

**RFR.GROUND™ Calculation Methodology**  
**Determination by Computer**  
**of Compliance with Human Exposure Limitations**

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements, which are nearly identical to the more recent Institute of Electrical and Electronics Engineers Standard C95.1-1999, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

The FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) gives the formula for calculating power density from an individual radiation source:

$$\text{power density } S = \frac{2.56 \times 1.64 \times 100 \times \text{RFF}^2 \times [\text{VERP} + \text{AERP}]}{4\pi D^2}, \text{ in mW/cm}^2,$$

where VERP =  $0.4 \times$  total peak visual ERP (all polarizations), in kilowatts for NTSC,  
= average power (all polarizations), in kilowatts for DTV,

AERP = total aural ERP (all polarizations), in kilowatts,

RFF = relative field factor at the direction to the actual point of calculation, and

D = distance from the center of radiation to the point of calculation, in meters.

The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 ( $1.6 \times 1.6 = 2.56$ ). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 0.4 converts NTSC peak visual ERP to an average RMS value; for FM, cellular, and PCS stations, of course, the value of VERP is zero. The factor of 100 in the numerator converts to the desired units of power density.

This formula has been built into a computer program by Hammett & Edison that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radiation sources. The program also allows for the description of the actual terrain at the site to obtain more accurate projections.



## RFR.TOWER™ Calculation Methodology

### Determination by Computer of Compliance with Human Exposure Limitations

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection, which are nearly identical to the more recent Institute of Electrical and Electronics Engineers Standard C95.1-1999, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

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$$\text{power density } S = \frac{2.56 \times 1.64 \times 100 \times \text{RFF}^2 \times [\text{VERP} + \text{AERP}]}{4\pi D^2}, \text{ in mW/cm}^2,$$

where VERP = 0.4 x total peak visual ERP (all polarizations), in kilowatts for NTSC,  
= average power (all polarizations), in kilowatts for DTV,

AERP = total aural ERP (all polarizations), in kilowatts,

RFF = relative field factor at the direction to the actual point of calculation, and

D = distance from the center of radiation to the point of calculation, in meters.

The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 ( $1.6 \times 1.6 = 2.56$ ). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 0.4 converts NTSC peak visual ERP to an average RMS value; for FM, cellular, and PCS stations, of course, the value of VERP is zero. The factor of 100 in the numerator converts to the desired units of power density.

This formula has been built into a computer program by Hammett & Edison that calculates the total expected RF power density at any point on a tower structure. The program allows for multiple sources on multiple towers in order to accurately model multiple-user antenna sites. Appropriate horizontal and vertical antenna patterns are used; actual vertical antenna patterns may be specified, or the pattern envelopes developed in "An Engineering Assessment of the Potential Impact of Federal Radiation Protection Guidance on the AM, FM, and TV Broadcast Services," U.S. Environmental Protection Agency, April 1985, may be used. For the standard pattern envelopes, minimum relative field values are conservatively limited to 15% for FM, 20% for VHF TV, and 10% for UHF TV. For nearby sources, the energy is assumed to radiate proportionally from each bay of the antenna to account conservatively for near-field effects.

The results of the program are typically presented in tabular form, with each row representing the compliant operating restrictions for one tower or for a particular section on one tower. The allowed operating powers for calculated RF fields at that location to remain less than the standard allows for exposures of unlimited duration are expressed as a percentage of full licensed power, and *all* stations with amounts less than 100% must reduce power simultaneously in order to meet the calculated conditions. Also typically shown is the Free Height, below which the calculated power density levels are less than the standard for all operating configurations of main and auxiliary antennas. It is recommended that, to the extent possible, the antennas for non-broadcast services on a tower be mounted below the calculated Free Height, such that access to them need not require reductions in power of the broadcast facilities.

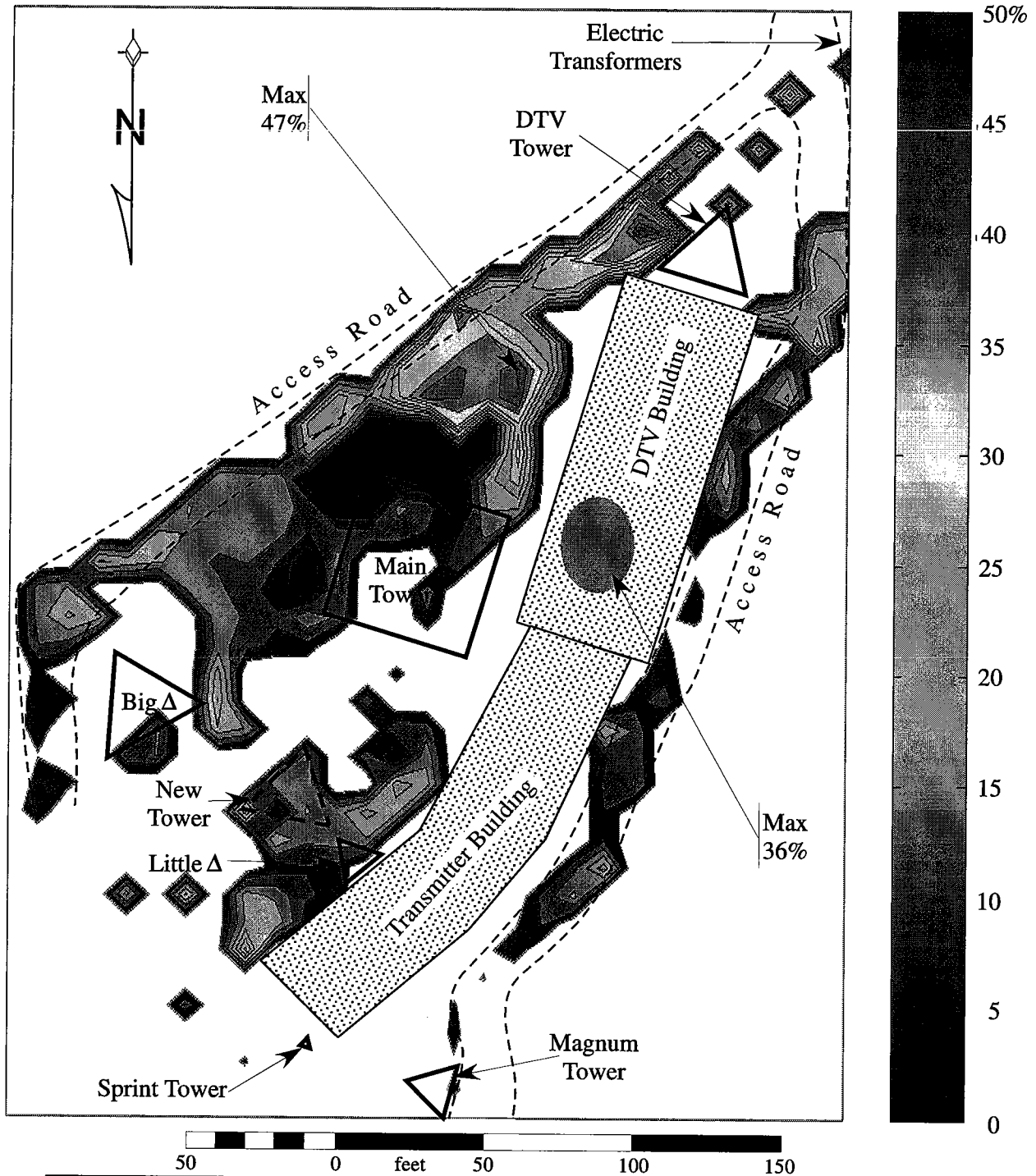
The reduced-power operating conditions shown are those that we believe to be the most equitable, in that they force the largest contributors of RF power density to reduce power the most. In some situations, several equally attractive combinations may exist, in which case different options may be shown in the table, identified by sequential lower case letters next to the tower height at which the power reductions are shown; each is an acceptable method of achieving compliance. Certain tables of results will include separate columns for the main and auxiliary antennas, when a licensed auxiliary exists; the station may operate from either antenna, at the appropriate power level shown. Unusual situations may require specifications that do not conform to the standard table format described here; in those cases footnotes on the table will explain special conditions necessary to achieve compliance.

It is specifically noted that the determinations of compliance reported in the table of results are based on available information about the site and transmitting facilities and on calculations of ambient exposure conditions. It is expected that *localized* exposure conditions may exceed calculated *ambient* conditions, particularly near antennas or guy-wire and cross-arm attachments. No attempt has been made to predict the effect of those localized effects, beyond the "ground" reflection factor included in the OST-65 formula. Measurements of actual ambient and localized fields would take precedence over predictions, and such measurements may be desirable in areas of prolonged or frequent access.



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Measured Ground-Level RF Power Densities  
All Stations Operating from Main Antennas



Power density measurements taken November 19, 2002, using Wandel & Goltermann Type EMR-300 Radiation Meter and Type 25 isotropic electric field probe. Readings expressed as percentage of FCC occupational limit. Spatial averaging not used. White areas not surveyed, but believed to be less than 20% of occupational limit.



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Figure 5

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RF Exposure Conditions

Schedule of Recommended Operating Powers  
To Achieve Calculated Compliance with Exposure Standards  
(Without Personal Protective Clothing)

Height on Tower (ft AGL)	• Main Tower •															
	FM Master	97.9	96.3	105.7	100.3	97.1	106.5	93.3	101.9	101.1	102.7	104.3	N05 KSL-TV	N24 KPNZ	N30 KUWB	DTV Upper
185-top	0	35	25	10	10	5	25	15	50	60	45	50	0	5	5	5
130-185	0	35	25	10	10	5	25	15	50	60	45	50	100	5	5	100
0-130	100	35	25	10	10	5	25	15	50	60	45	50	100	100	100	100
Unlimited access	0	35	25	10	10	5	25	15	50	60	45	50	0	5	5	5
Free Height: none																

• DTV Tower •

Height on Tower (ft AGL)	• DTV Tower •															
	FM Master	97.9	105.7	100.3	97.1	106.5	93.3	102.7	N05 KSL-TV	N24 KPNZ	N30 KUWB	DTV Lower	DTV Upper			
225-top	5	80	25	25	20	80	25	80	60	0	0	0	0			
135-225	5	80	25	25	20	80	25	80	60	0	0	5	100			
25-135	100	80	25	25	20	80	25	80	100	100	100	100	100			
0-25	100	100	100	100	100	100	100	100	100	100	100	100	100			
Unlimited access	5	80	25	25	20	80	25	80	60	0	0	0	0			
Free Height: 25 ft																

• Magnum Tower •

Height on Tower (ft AGL)	• Magnum Tower •															
	FM Master	97.9	103.5	N50	N18	N05 KSL-TV	96.3	105.7	100.3	97.1	2 GHz Sprint					
140-top	55	0	0	0	0	0	30	40	40	55	50					
100-140	100	0	0	0	0	0	30	40	40	55	50					
50-100	100	0	0	0	0	100	30	40	40	55	50					
0-50	100	0	0	100	100	100	30	70	45	55	100					
Unlimited access	55	0	0	0	0	0	30	40	40	55	50					
Free Height: none																

Notes: Calculations based on FCC OET Bulletin No. 65, August 1997.

Entries in table represent recommended percentage of licensed power.

Power reductions apply for any access to the pertinent tower section.

Antennas not appearing in table may be operated on either main or auxiliary at full power.

Unlimited access powers, where shown, represent reductions that bring entire tower within limit.

DTV Utah, LLP • Farnsworth Peak, Utah  
RF Exposure Conditions

Schedule of Recommended Operating Powers  
To Achieve Calculated Compliance with Exposure Standards  
(Without Personal Protective Clothing)

• Big Δ Tower •														
Height on Tower (ft AGL)	FM Master	97.9 KBZN*	96.3 KXRR*	105.7 KOPX*	100.3 KSFI*	97.1 KISN*	106.5 KOSY*	93.3 KUBL*	101.9 KKAT*	101.1 KBER*	102.7 KOMB*	104.3 KSOP*		
20-top	100	50	25	5	5	0	0	5	10	20	5	5		
0-20	100	100	25	100	100	5	10	100	10	20	5	5		

Free Height: none

• Little Δ Tower •														
Height on Tower (ft AGL)	FM Master	97.9 KBZN*	103.5 KRSP*	96.3 KXRR*	100.3 KSFI*	97.1 KISN*	106.5 KOSY*	93.3 KUBL*	102.7 KOMB*	104.3 KSOP*				
0-top	100	55	70	0	55	20	25	20	40	75				

Free Height: none

• KSOP Pole •														
Height on Tower (ft AGL)	FM Master	96.3 KXRR*	100.3 KSFI*	97.1 KISN*	106.5 KOSY*	93.3 KUBL*	101.9 KKAT*	101.1 KBER*	102.7 KOMB*	104.3 KSOP*				
0-top	100	5	80	75	5	15	40	15	5	0				

Free Height: none

• KQMB Pole •														
Height on Tower (ft AGL)	FM Master	106.5 KOSY*	93.3 KUBL*	101.9 KKAT*	101.1 KBER*	102.7 KOMB*	104.3 KSOP*	90.9 KRCL*						
0-top	100	25	20	20	35	0	5	0						

Free Height: none

Notes: Calculations based on FCC OET Bulletin No. 65, August 1997.  
Entries in table represent recommended percentage of licensed power.  
Entries in italics indicate alternate operation on auxiliary facilities (if available).  
Power reductions apply for any access of any duration to the pertinent tower section.  
Antennas not appearing in table may be operated on either main or auxiliary at full power.  
Unlimited access powers, where shown, represent reductions that bring entire tower within limit.



DTV Utah, LLP • Farnsworth Peak, Utah  
RF Exposure Conditions

Schedule of Recommended Operating Powers  
To Achieve Calculated Compliance with Exposure Standards  
(Without Personal Protective Clothing)

• KUBL Pole •

Height on Tower (ft AGL)	FM Master	105.7 KCPX*	100.3 KSF1*	97.1 KISN*	106.5 KOSY*	93.3 KUBL*	101.9 KKAT*	101.1 KBER*	102.7 KOMB*	104.3 KSOP*
0-top	100	25	20	5	20	0	0	0	10	10

Free Height: none

• Ch. 13 Tower •

No reduced operating powers have been derived for this tower, due to its distance from the other towers at Farnsworth Peak.

• Sprint Tower •

Height on Tower (ft AGL)	FM Master	97.9 KBZN*	103.5 KRSP*	105.7 KEIT-LP	96.3 KXRR*	105.7 KCPX*	100.3 KSF1*	97.1 KISN*	106.5 KOSY*	93.3 KUBL*	102.7 KOMB*	102.7 K18FJ	2 GHz Sprint
55-top	100	1	20	50	20	20	15	20	50	50	70	70	0
0-55	100	1	20	50	20	20	15	20	50	50	70	100	100

Free Height: none

• New Tower •

Height on Tower (ft AGL)	FM Master	97.9 KBZN*	103.5 KRSP*	105.7 KEIT-LP	96.3 KXRR*	100.3 KCPX*	105.7 KSF1*	106.5 KOSY*	93.3 KUBL*	102.7 KOMB*	104.3 KSOP*	N05 KSL-TV	N24 KPNZ	N30 KUWB	DTV Lower	DTV Upper
135-top	0	20	5	1	5	10	20	20	20	20	50	0	15	15	10	10
0-135	100	20	5	1	5	10	20	20	20	20	50	100	100	100	100	100

Free Height: none

Notes: Calculations based on FCC OET Bulletin No. 65, August 1997.  
Entries in table represent recommended percentage of licensed power.  
Entries in italics indicate alternate operation on auxiliary facilities (if available).  
Power reductions apply for any access of any duration to the pertinent tower section.  
Antennas not appearing in table may be operated on either main or auxiliary at full power.  
Unlimited access powers, where shown, represent reductions that bring entire tower within limit.