DTV Transition Technical Challenges

Presented to the

Federal Communications Commission

November 16, 2007


459 days

DTV Transition
Technical Challenges

- Welcome
- Introduction
- Brief overview of issues
- Station tour
- Transmitter visit
- Return to FCC

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DTV Table and Coverage Issues

- DTV table potential issues
  - Antenna pattern issues
  - Data base differences
- Modifications/applications process
- Petitions for Reconsideration filed (116)
  - Not sure entire industry was aware
  - MSTV filed petition for entire industry
  - Problems should be resolved in Third Periodic

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Antenna Pattern Issues

- Impacts stations going back to analog channels
  - Approx 500 stations are moving back
  - Biggest impact is on the UHF to VHF shifts
  - May have impact on some UHF to UHF shifts
- Appears to affect 260 stations
- Bottom line: Stations going back to analog channels should be able to use non-directional analog antenna and analog antenna pattern

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Antenna Pattern Issues

- Analog antenna pattern does not match antenna pattern contained in Table B
- Reasonable expectation that stations going back to analog channel would be able to use existing analog antenna

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Antenna Pattern Issues

- Antenna is designed specifically for use on a particular channel to provide the required azimuth pattern for that unique FCC antenna ID
- Antennas purchased in last 8-10 years can be used for digital
- Not using analog antenna pattern MAY LEAD TO REDUCED DTV COVERAGE

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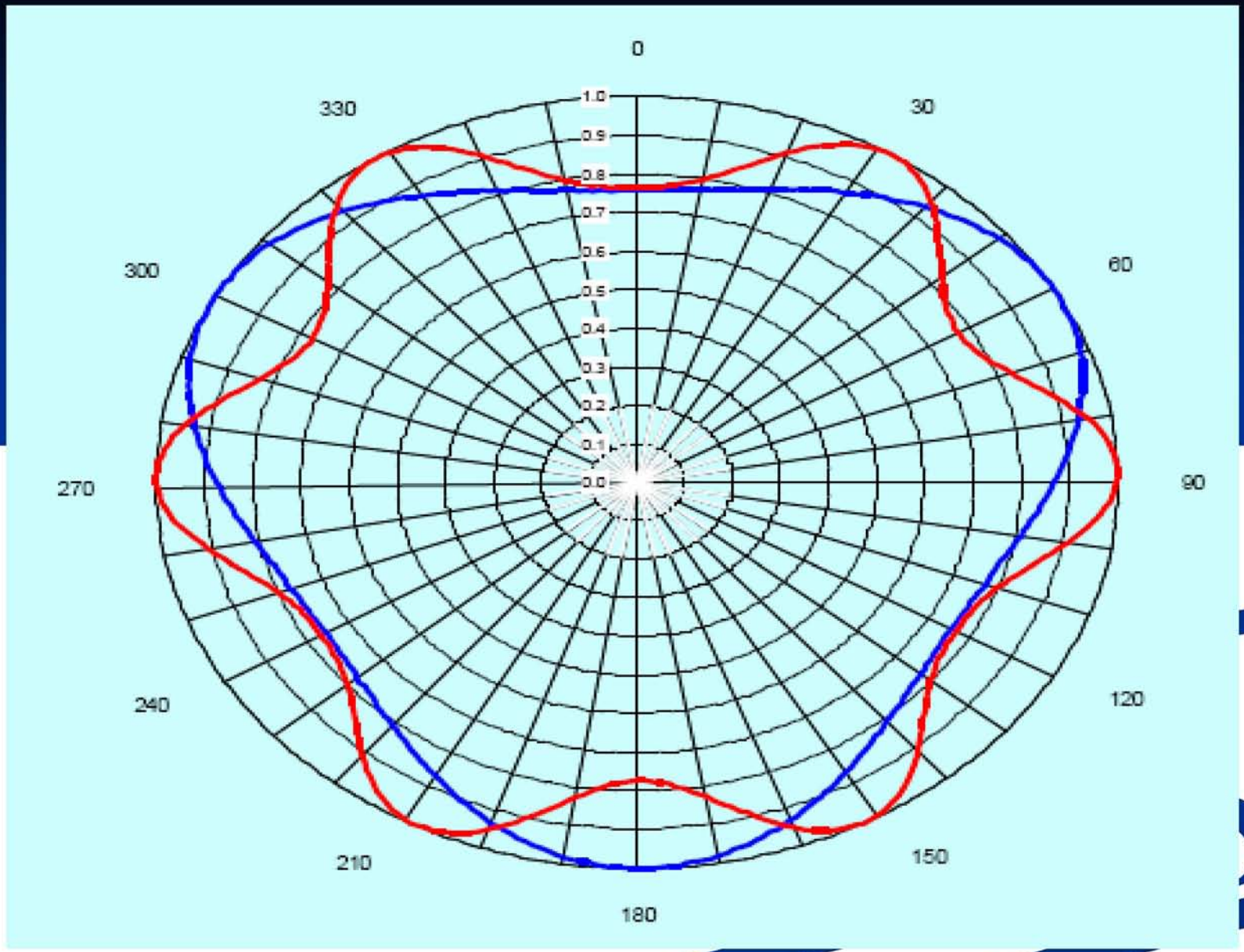

UHF

Blue

Ante

Antenna Pattern Issues in DTV Table

Antenna Patterns

- Real World Example
  - WUSA-TV in Washington, DC

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Antenna Pattern Issues

- Benefits of allowing stations to use current analog antennas
  - Greater DTV coverage
  - Eliminates service loss while new antenna is installed
  - Reduces demand for new antennas
  - Reduces demand for tower crews
  - Reduces administrative burden on FCC

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Antenna Pattern Issues

- Allow stations going back to analog channels to use current antenna pattern, provided
  - On a temporary basis
    - Pattern does not exceed Table B coverage area by 5 miles, or
    - No more than 2% interference to surrounding stations
  - Stations will have 12 months after February 17, 2009, to comply with the 0.5% interference standard (above Table B levels)

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Top-Mount/Side-Mount Issue

- Digital side-mount, analog top-mount
- May allow a station to keep digital side-mount, providing it meets 90 - 100% of replicated coverage area (either analog or digital)
  - If so, the station can wait until after Feb 17, 2009, to move its digital antenna to the top and operate at full facilities
- Focus on how much of replicated coverage area served by side-mounted digital
- Solution may not work for many stations

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Top-Mount/Side-Mount Issue

- Estimates of DTV Antenna Sales (*Dialectric sale of 1000 antennas)*
  - 40.5% top-mount
  - 60% side-mounts
  - 46% omni directional
  - 54% directional

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Top-Mount/Side-Mount Issue

- Steps necessary to complete the switch before before February 17, 2009
  - Must take down top-mounted analog antenna
  - Must take down digital side-mount
  - Must install a new digital top-mount
  - May have to install new analog side-mount
  - Must run new transmission lines
  - Complex on towers with multiple antennas

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Top-Mount/Side-Mount Issue

- Cannot simply switch top-mount to side-mount antennas
  - Top-mount antennas heavier than side-mounts
  - Causes dangerous stress on the tower
- Side-mounts cannot be placed on top

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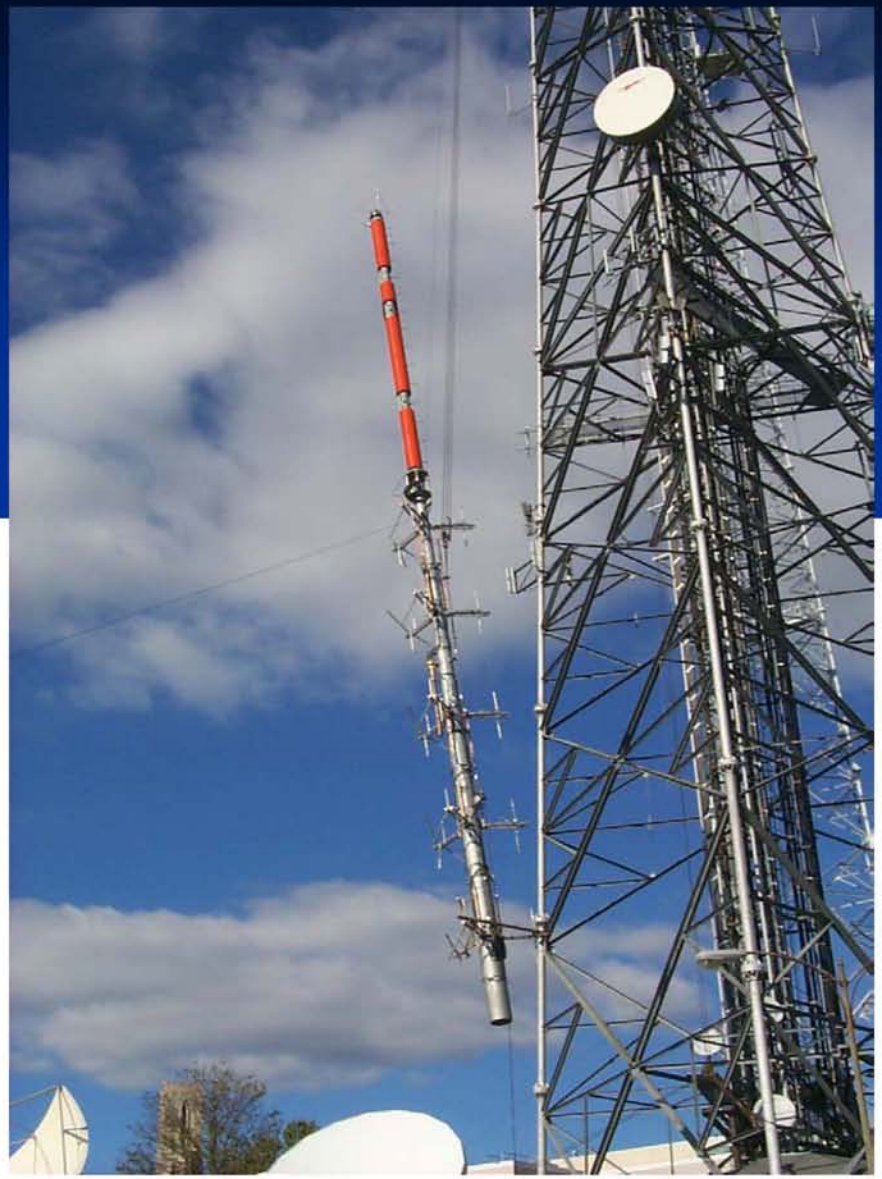

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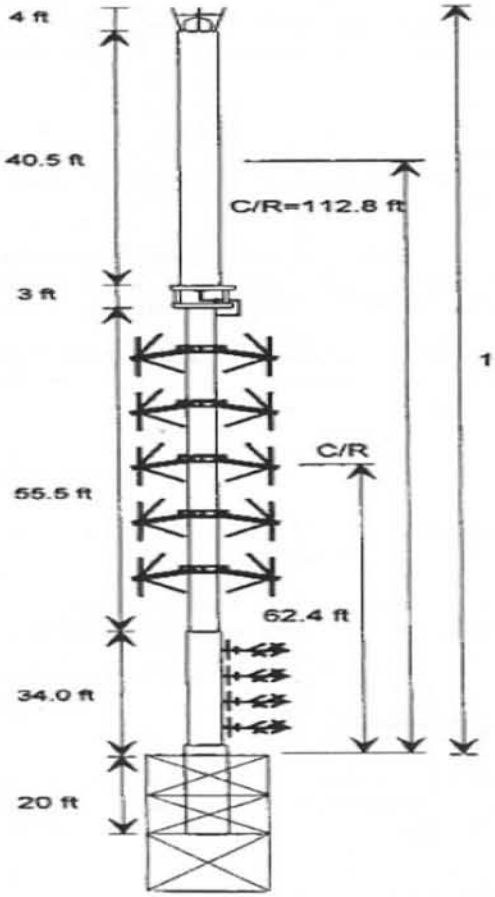
DIELECTRIC

PROPOSED ANTENNA CONFIGURATION
WRC-TV
WASHINGTON, DC

Dual Beacon required:
Hughey-Phillips design to
maintain 4 ft. height



CH 48
TFU-26GTH/VP-R
6" Input

137 ft Overall (Above tower top)

CH 4
TDM-5A4
2 x 4" Input

FM
DCR-MBR4 (with Vpol parasitics)
1 x 4" Input
C/R=18.6 ft

28" Diameter bury(existing)

WIND LOAD REQUIREMENTS

ANSI/EIA-222-F Specification
Basic Wind Speed: 80 mph

CaAc = 337 ft² Above Tower Top
Moment Arm= 51.2 ft

Bury Section:
CaAc = 58 ft² Below Tower Top
Moment Arm = 10.3 Below Tower Top

Weight = 19.8 t

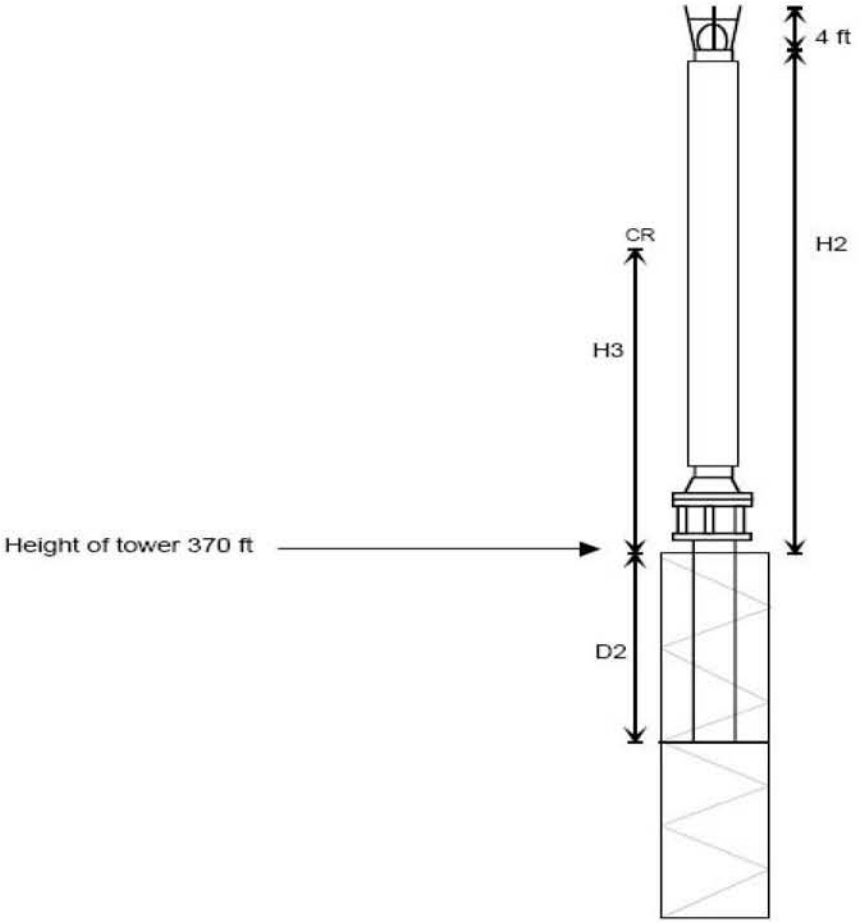
EHM-970609-3SK

DIELECTRIC COMMUNICATIONS
A UNIT OF GENERAL SIGNAL
RAYMOND, ME TEL 207-655-4555 FAX 207-655-7120

Dielectric

Proposal #: C-01135 Antenna Type: TFU-30GTH/VP-R O6 Channel: 34 DTV

Call Letters: KWGN-DT Location: Denver, CO



Mechanical Specifications

TIA/EIA-222-F. @ 120 mi/h (193.1 km/h)

CaAc = 100 ft²(9.3 m²)
D1 = 33.5 ft(10.21 m)
CaAc = 19.3 ft²(1.8 m²) Below tower top
D3 = 5.9 ft(1.8 m) Below tower top
D2 = 12 ft(3.7 m)
W = 15800 lbs(7.2 t)

TFU-30GTH/VP-R O6
Channel: D34

SWB-070306-2

Not to Scale

Mechanical Specifications

Model	Length with 4 ft. Lightning Rods H_4 (ft)	Loads @ EIA-222-C 50/33.3 PSF Shear (lbs)	Moment (lb-ft)	Loads @ TIA-EIA-222-F Area CfAc (ft^2)	Moment Arm D_1 (ft)	Weight (lbs)
TUF-O4-4/16H-1	20.5	1600	14000	34	8.9	2500
TUF-O4-6/24H-1	28.1	2300	28000	46	12.6	4000
TUF-O4-8/32H-1	35.7	3000	48000	58	16.4	5100
TUF-O4-10/40H-1	43.3	3600	72000	70	20.2	6500
TUF-O4-12/48H-1	50.9	4300	102000	82	24.0	8000
TUF-O4-14/56H-1	58.5	5000	132000	94	27.8	9200
TUF-O4-16/64H-1	66.1	5700	162000	106	31.6	10500

Typical Mechanical Characteristics*

	Channel	Freq MHz	H2 ft	H3 ft	D1 ft	R1 lbs	Moment ft-lbs	CaAc ft^2	Natural Freq. Hz	Weight lbs
TW-7Bx-R	7	177	50.9	27.4	26.4	2890	76290	52.8	1.04	8100
	8	183	49.5	26.5	25.8	2820	72680	51.5	1.11	7900
	9	189	48.1	25.7	25.2	2750	69250	50.2	1.17	7700
	10	195	46.9	25.1	24.6	2680	66010	49.0	1.23	7500
	11	201	45.7	24.2	24.1	2620	63170	47.9	1.29	7300
	12	207	44.6	23.5	23.6	2570	60700	46.9	1.36	7200
	13	213	43.6	23.0	23.2	2510	58120	45.9	1.42	7000
TW-7Bx slot covers	7	177	50.9	27.4	27.4	2070	56770	37.7	1.04	8000
	8	183	49.5	26.5	26.7	2020	53980	36.8	1.11	7800
	9	189	48.1	25.7	26.1	1970	51340	36.0	1.17	7600
	10	195	46.9	25.1	25.4	1930	49110	35.2	1.23	7500
	11	201	45.7	24.2	24.9	1890	47000	34.4	1.29	7300
	12	207	44.6	23.5	24.3	1850	44990	33.7	1.36	7200
	13	213	43.6	23.0	23.8	1810	43080	33.1	1.42	7000
TW-9Bx-R	7	177	59.2	31.5	30.8	3760	115630	68.6	1.02	12600
	8	183	57.5	30.5	30.0	3650	109480	66.7	1.08	12200
	9	189	55.9	29.6	29.3	3560	104250	65.0	1.14	11900
	10	195	54.5	28.9	28.6	3470	99300	63.3	1.20	11600
	11	201	53.1	27.9	28.0	3380	94600	61.8	1.27	11300
	12	207	51.8	27.1	27.4	3300	90410	60.3	1.33	11000
	13	213	50.5	26.4	26.8	3230	86690	58.9	1.40	10800
TW-9Bx slot covers	7	177	59.2	31.5	32.2	2790	89940	50.9	1.02	12500
	8	183	57.5	30.5	31.4	2710	85080	49.6	1.08	12200
	9	189	55.9	29.6	30.6	2650	81110	48.3	1.14	11800
	10	195	54.5	28.9	29.9	2580	77060	47.1	1.20	11500
	11	201	53.1	27.9	29.2	2520	73510	46.0	1.27	11300
	12	207	51.8	27.1	28.5	2460	70150	45.0	1.33	11000
	13	213	50.5	26.4	27.9	2410	67240	44.0	1.40	10700
TW-12Bx-R	7	177	75.9	39.9	38.2	3310	126550	87.1	0.62	16000
	8	183	73.6	38.6	37.2	3220	119890	84.6	0.66	15600
	9	189	71.5	37.4	36.3	3130	113610	82.3	0.70	15100
	10	195	69.6	36.5	35.4	3470	122900	80.1	0.74	14700
	11	201	67.7	35.2	34.6	3380	116910	78.1	0.78	14300
	12	207	66.0	34.2	33.8	3290	111240	76.1	0.82	14000
	13	213	64.4	33.4	33.1	3220	106500	74.3	0.86	13600
TW-12Bx slot covers	7	177	75.9	39.9	40.6	2780	112760	64.3	0.62	15900
	8	183	73.6	38.6	39.4	2710	106900	62.5	0.66	15500
	9	189	71.5	37.4	38.4	2630	101000	60.9	0.70	15100
	10	195	69.6	36.5	37.4	2560	95800	59.3	0.74	14700
	11	201	67.7	35.2	36.5	2500	91250	57.8	0.78	14300
	12	207	66.0	34.2	35.6	2440	86950	56.4	0.82	13900
	13	213	64.4	33.4	34.8	2380	82860	55.1	0.86	13600

x = Channel number
R = Radomed
H2 = Antenna height without lightning protector
H4 = Height with lightning protector (H4=H2+4 feet)
H3 = Center of radiation
CaAc = Force Coefficient Projected Area (4 foot lightning protector and beacon included)
D1 = Moment Arm

Formula for Projected Area according to EIA-222C: A = 1.11 x (CaAc-1)

Antenna designed in accordance with AISC specifications for design of structural steel for building as prescribed by TIA/EIA-222-F.

TW7 and TW9 based on 90 mi/h basic wind speed

TW12 based on 80 mi/h windspeed

TW-12Bx-R Ch 7, 8, 9 based on 75 mi/h basic wind speed

*Contact factory for application specific mechanical details.

THV Series - Mechanical Specifications -Typical

Cardioid Pattern

Top Mount

NOTE: Typical loads for Cardioid Pattern
x = Channel number
R = Radomed

H2 - Overall height without lightning protection
H3 - Centerline of radiation
H4 - Overall height with lightning protection

						RS-222-C		TIA/EIA-222-F		
	Channel	H4 (ft)	H2 (ft)	H3 (ft)	W (lbs)	A (ft^2)	D1 (ft)	CaAc (ft^2)	D1 (ft)	Limits
THV-6Ax-R	7	48.0	44.0	24.2	7900	58	23.9	55	24.3	120 psf
	8	46.6	42.6	23.4	7660	57	23.2	54	23.6	or
	9	45.3	41.3	22.6	7440	55	22.5	52	22.9	135 mi/h
	10	44.1	40.1	21.9	7230	53	21.8	51	22.3	bws
	11	42.9	38.9	21.3	7030	52	21.2	49	21.7	
	12	41.9	37.9	20.7	6850	51	20.7	48	21.1	
	13	40.8	36.8	20.1	6670	49	20.1	47	20.5	
THV-10Ax-R	7	65.7	61.7	30.8	10870	87	31.8	82	32.0	50 psf
	8	63.8	59.8	29.9	10550	84	30.9	79	31.1	or
	9	62.0	58.0	29.0	10240	81	30.0	77	30.2	90 mi/h
	10	60.3	56.3	28.1	9960	79	29.1	75	29.3	bws
	11	58.7	54.7	27.4	9690	77	28.3	73	28.5	
	12	57.2	53.2	26.6	9430	75	27.6	71	27.8	
	13	55.8	51.8	25.9	9190	73	26.9	69	27.1	
THV-12Ax-R	7	76.8	72.8	36.4	15400	116	37.3	108	37.4	50 psf
	8	74.5	70.5	35.3	14930	112	36.1	105	36.3	or
	9	72.4	68.4	34.2	14490	109	35.0	102	35.2	90 mi/h
	10	70.4	66.4	33.2	14080	105	34.0	99	34.2	bws
	11	68.5	64.5	32.3	13690	103	33.1	96	33.3	
	12	66.7	62.7	31.4	13330	100	32.2	93	32.4	
	13	65.1	61.1	30.5	12280	97	31.4	91	31.6	

VHF Top-Mount Specifications

TFU-DSB

TLP Series

DL Series

Antenna Type	Azimuth Pattern	Peak Power Gain Ratio[1]	Gain dB	Height (ft)	Weight (lb)	RS-222-C spec A ft	EIA-222-F spec Ca ft
TLP- 8A	TLP- A	8. 0	9. 0		80 to 140	3.7 to 7.0	6.6 to 12.5
TLP-8B	TLP-B	13.6	11.3	10.5	60 to 90	4.1 to 7.0	7.9 to 13.4
TLP-8D	TLP-D	23.2	13.7	to	70 to 130	8.2 to 19.7	11.5 to 27.7
TLP-8E	TLP-E	31.2	14.9		80 to 160	11.3 to 28.2	15.9 to 39.7
TLP-8J	TLP-J	16.0	12.0	18.8	80 to 150	9.2 to 22.8	12.9 to 32.1
TLP-8M	TLP-M	15.2	11.8		80 to 160	11.1 to 27.7	15.5 to 38.9
TLP-12A	TLP-A	12.0	10.8		110 to 180	5.4 to 10.1	9.6 to 18.1
TLP-12B	TLP-B	20.4	13.1	15.4	80 to 120	6.0 to 10.2	11.6 to 19.7
TLP-12D	TLP-D	34.8	15.4	to	100 to 180	12.2 to 29.2	17.1 to 41.1
TLP-12E	TLP-E	46.8	16.7		110 to 220	16.8 to 42.1	23.6 to 59.1
TLP-12J	TLP-J	24.0	13.8	27.1	110 to 210	13.7 to 34.0	19.2 to 47.8
TLP-12M	TLP-M	22.8	13.6		110 to 220	16.5 to 41.2	23.1 to 57.9
TLP-16A	TLP-A	16.0	12.0		230 to 340	13.2 to 19.8	23.7 to 35.5
TLP-16B	TLP-B	27.2	14.3	22.2	190 to 250	14.1 to 19.8	26.3 to 37.4
TLP-16D	TLP-D	46.4	16.7	to	220 to 330	22.3 to 45.2	33.6 to 65.9
TLP-16E	TLP-E	62.4	18.0		240 to 380	28.5 to 62.3	42.2 to 89.9
TLP-16J	TLP-J	32.0	15.1	38.6	230 to 370	24.3 to 51.5	36.4 to 74.8
TLP-16M	TLP-M	30.4	14.8		240 to 380	28.0 to 61.2	41.6 to 88.3
TLP-24A	TLP-A	23.0	13.6		340 to 500	19.8 to 29.8	35.6 to 53.4
TLP-24B	TLP-B	39.1	15.9	33.8	270 to 370	21.1 to 29.8	39.5 to 56.2
TLP-24D	TLP-D	66.7	18.2	to	320 to 490	33.5 to 67.8	50.5 to 98.9
TLP-24E	TLP-E	89.7	19.5		340 to 560	42.7 to 93.5	63.5 to 135.0
TLP-24J	TLP-J	46.0	16.6	58.4	340 to 540	36.5 to 77.3	54.7 to 112.3
TLP-24M	TLP-M	43.7	16.4		340 to 560	42.0 to 91.8	62.4 to 132.6
TLP-32A	TLP-A	31.0	14.9		470 to 680	26.5 to 39.7	47.5 to 71.2
TLP-32B	TLP-B	52.7	17.2	45.5	380 to 500	28.2 to 39.7	52.7 to 74.9
TLP-32D	TLP-D	89.9	19.5	to	440 to 660	44.7 to 90.4	67.4 to 131.9
TLP-32E	TLP-E	120.9	20.8		470 to 760	57.0 to 124.7	84.6 to180.0
TLP-32J	TLP-J	62.0	17.9	78.1	460 to 740	48.6 to 103.1	72.9 to 149.8
TLP-32M	TLP-M	58.9	17.7		470 to 760	56.0 to 122.4	83.3 to 176.8

[1] Contact factory for gains of elliptically or circularly polarized versions.
[2] Windload at 50/33 lb/ft² per EIA RS-222-C

Mechanical Specifications - Typical

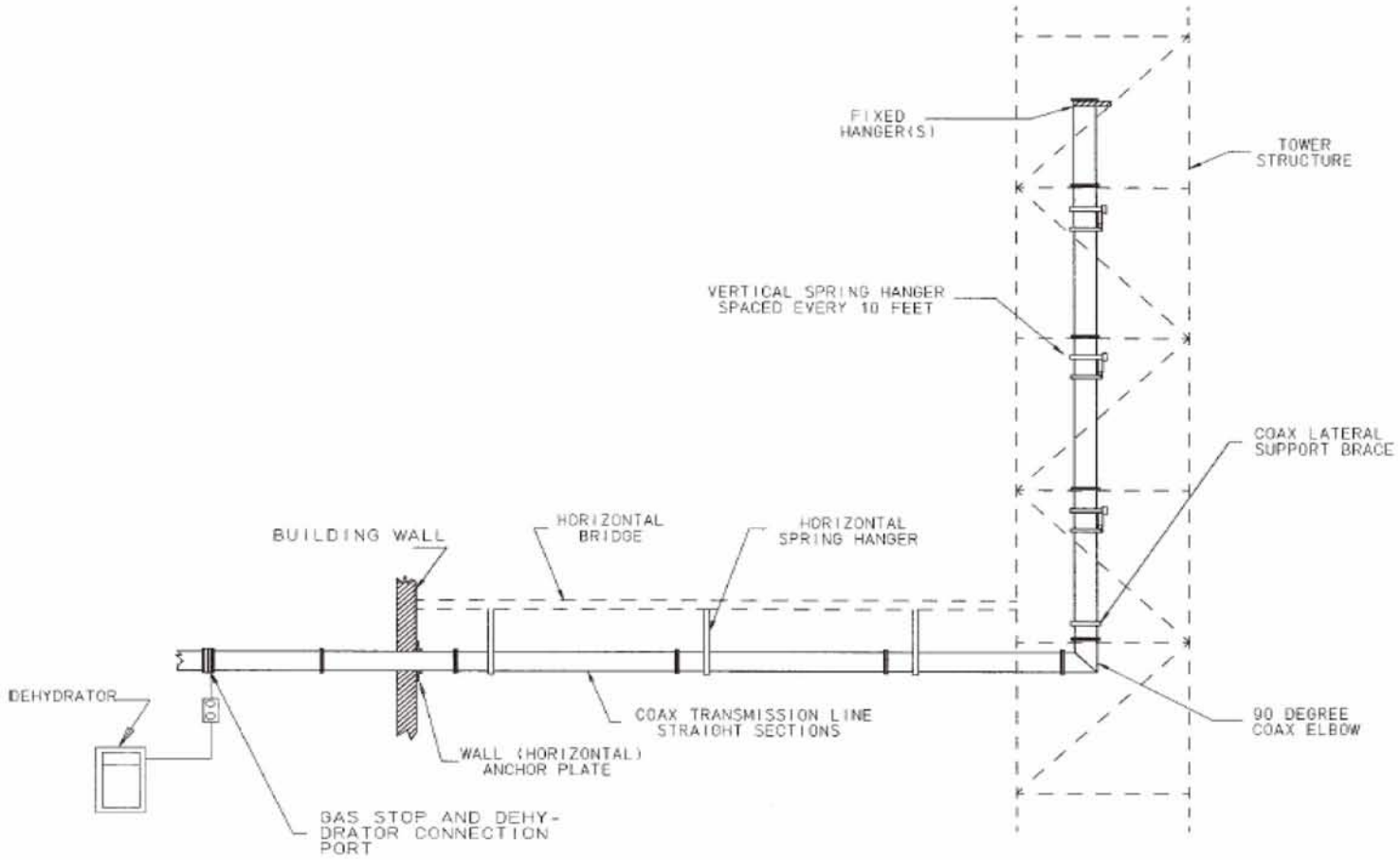
Cardioid Pattern

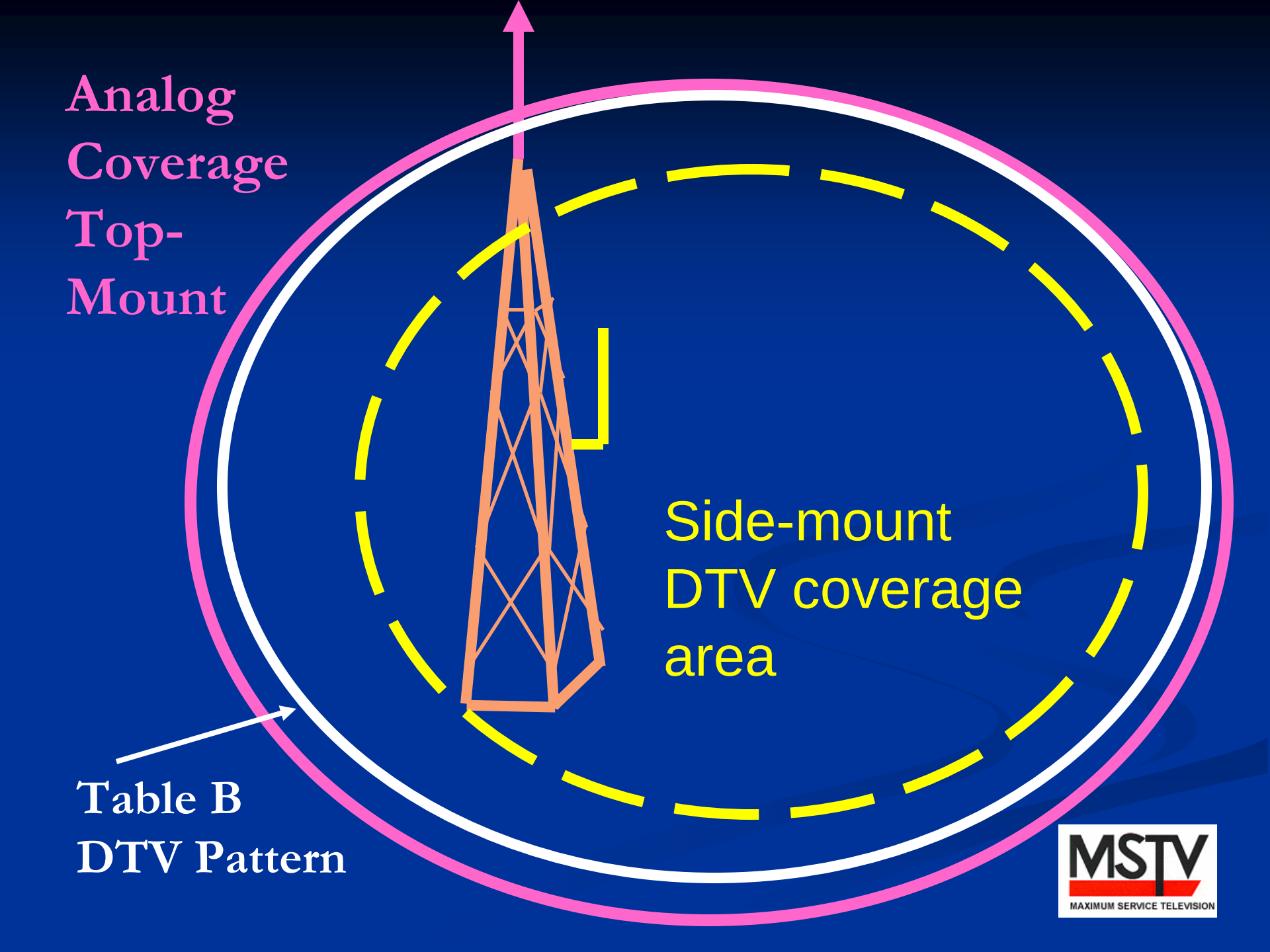
			RS-222-C		TIA/EIA-222-F	
	Channel	H2(ft)	H3(ft)	W(lbs)	A(ft^2)	CaAc(ft^2)
THV-6Ax-R	7	44.0	24.2	1600	56	102
	8	42.6	23.4	1550	54	99
	9	41.3	22.6	1510	52	96
	10	40.1	21.9	1470	51	93
	11	38.9	21.3	1440	49	90
	12	37.9	20.7	1400	48	88
	13	36.8	20.1	1370	47	85
THV-10Ax-R	7	61.7	30.8	2180	84	154
	8	59.8	29.9	2110	81	149
	9	58.0	29.0	2060	79	144
	10	56.3	28.1	2000	77	140
	11	54.7	27.4	1950	74	136
	12	53.2	26.6	1900	72	132
	13	51.8	25.9	1860	70	129
THV-12Ax-R	7	72.8	36.4	2530	100	183
	8	70.5	35.3	2460	97	177
	9	68.4	34.2	2390	94	171
	10	66.4	33.2	2330	91	166
	11	64.5	32.3	2270	88	161
	12	62.7	31.4	2210	86	157
	13	61.1	30.5	2160	83	157

H2 - Overall height without lightning protection
H3 - Centerline of radiation

NOTE: Typical loads for Cardioid Pattern
x = Channel number
R = Radomed

Coaxial Transmission Line System Worksheet




Analog Coverage Top-Mount
Side-mount DTV coverage area
Table B DTV Pattern
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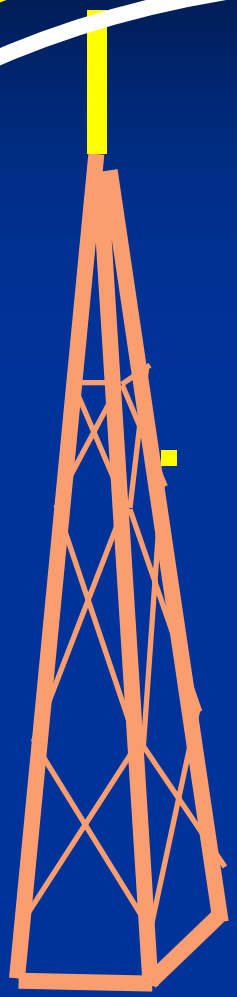

DTV Top-Mount Coverage Area

No analog service prior to February 17, 2009

Table B DTV Pattern

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Top-Mount/Side-Mount: Concerns

- Take down top-mount analog antenna early to place DTV antenna on top (Summer 2008)
- Cannot switch side-mount and top-mount antennas
- New analog side-mount (unrealistic for 6 months)
  - Antenna manufacturers may not meet the demand
  - Exacerbates tower crew shortage
  - Costs for antenna, transmission line, installation

Top-Mount/Side-Mount: Concerns

- Consumers may lose all analog service months ahead of the transition date
  - Consumer confusion - education focuses on February 17, 2009
  - Supply of converter boxes and DTV consumer equipment uncertain

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Top-Mount/Side-Mount: Proposed Solution

- Allow DTV side-mounts to remain and require stations to provide current levels of digital coverage
- Turn off analog (top-mount) on February 17, 2009
- Meet full DTV coverage 12 months after conversion date
  - Take down analog
  - Put new top-mount DTV

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Top-Mount/Side-Mount: Benefits of Proposal

- Full analog service until February 17, 2009
- Consumers do not have to transition before equipment is ready
- No loss of current DTV service levels
- Reduces unnecessary costs to transition
- Reduces demand for equipment and tower crews

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Top-Mount/Side-Mount Coverage Policy Balance

- Policy Balance: Service Coverage
  - Requiring Table B DTV coverage by February 17, 2009:
    - Early loss of analog service for an entire market (six months early)
  - MSTV Approach: No loss of service
    - Analog service remains
    - DTV service is not reduced
    - Consumers at edges of DTV service area may be delayed in receiving service for a temporary period

Accepting Maximization Requests

- Many stations want to maximize
- Equipment purchases delayed
  - Cannot assume maximization will be granted
  - Needless equipment purchases
- Lift freeze and establish date for accepting maximization applications

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Processing Issues

- Windows rather than waivers
- Upon notification to FCC allow stations to:
  - Analog reductions (12 months)
  - Analog termination (6 months)
  - Terminating digital to flashcut (6 months)
- One step licensing - no CP
- Coordination with MVPDs

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Questions?

Thank you!