

Technical Report Supporting a Form 349 **Amendment** to an Application for a New FM Translator Station

Pursuant to 47 C.F.R. Section 74:

for

*CH221D.A - Fort Worth, TX
BNPFT-20180423ABH
(Facility ID: 202298)*

*"Reduction in Antenna Height &
New Directional Antenna Pattern"*

as a

*Commercial, Fill-In Translator
for Class B AM Station
KKGM(AM) - Fort Worth, TX*

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RF Appendix 1 - Radio Frequency Radiation Compliance Showing

EXPLANATION OF PROPOSAL: This Form 349 Filing and accompanying technical report supports an Original Construction Permit Application Amendment for a new FM Translator facility for CH221D.P - Fort Worth, TX. This FCC Form 349 Filing requests a new CH221D (92.1 MHz) operation with a power of 0.0005 kW ERP (Horizontal Only Polarization). The FM Translator will operate from a COR of 179 meters AMSL. This Form 349 Filing will specify rebroadcast of Class B, AM Primary Station KKGM(AM) - Fort Worth, TX (1630 kHz); Facility ID No. 87147. The Translator will be licensed to the community of Fort Worth, TX. *This amendment is in response to a further Petition to Deny filed against the CH221D.P - Fort Worth, TX; BNPFT-20180423ABH (Facility ID: 202298) Long-Form Singleton Application as amended. The further amended operating parameters categorically resolve all 47 C.F.R. Section 74.1204(f) issues raised.*

FACILITY COMPLIANCE SHOWINGS: A map of the proposed 60 dBμ service contour has been included in **Exhibit 1**. The proposed 60 dBμ contour of the Translator lies wholly inside the larger of the AM primary daytime 2.0 mV/m contour or a 25 mile radius around the AM site. The primary station service contour relationship has been plotted in **Exhibit 2**.

The proposed facility will be located on the tower bearing Antenna Structure Registration Number 1238980. In support of this filing, a copy of the existing ASRN has been included in **Exhibit 3**. A depiction of the tower and antenna configuration has been included in **Exhibit 4**. Further notification to the FAA or ASR governing authorities is not required as this proposal will not increase the overall tower height.

The applicant would like to note use of the NED 03 second terrain database for all allocation, contour and HAAT showings contained herein. A copy of the proposed HAAT calculation has been included in **Exhibit 5**.

ALLOCATION COMPLIANCE SHOWINGS: The proposed Translator remains in compliance with 47 C.F.R. Section 74.1204 toward all allocation protection concerns with the exception of KZPS(FM) - Dallas, TX (CH223C) and KKXT(FM) - Dallas, TX (CH219C0). A general allocation study for this proposal is found in *Exhibit 6*.

The applicant would like to note the existence of a 47 C.F.R. Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Request toward KZPS(FM) - Dallas, TX (CH223C) and KKXT(FM) - Dallas, TX (CH219C0) as noted in *Exhibit 8*. Protection of the worst case calculated 120.6 dBμ F(50:10) Interference Contour, corresponding to the worst case calculated 80.6 dBμ F(50:50) Protected Contour, has been demonstrated through a downward radiation study. Full protection will be afforded each facility as this area will not reach the ground nor a seven meter artificial plane representing a standard two story house when taking into account the downward radiation characteristics of the antenna as supplied by the antenna manufacturer. A copy of the antenna manufacturer specifications has been included in *Exhibit 9*.

There are four additional facilities, existing or proposed, close enough to merit further study. Therefore, a supplemental contour protection study has been provided toward each facility as included in *Exhibit(s) 7(a-d)*. It is believed sufficient clearance exists, precluding the need for additional contour protection showings.

Regarding protection of international concerns, the facility is, and will remain, more than 320 km from the common border between the United States and Canada or Mexico. As a result, no further international protection showings are believed required.

ENVIRONMENTAL COMPLIANCE SHOWINGS: The proposed facility complies with the maximum permissible radiofrequency electromagnetic exposure limits for controlled and uncontrolled environments as set forth under §1.1310 and/or §1.1307(b)(3) of the Commission's rules and the guidelines for RF radiation protection guidelines as set forth in OET Bulletin No. 65 (Edition 97-01), and the accompanying Supplement A, (Edition 97-01). Compliance has been demonstrated in the attached **RF Appendix 1** of this filing. The facility is, or will be, properly marked with signs. Entry is, or will be, restricted by means of fencing with locked doors or gates. In addition, coordination with other users of the site will be secured to reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic fields in excess of FCC guidelines.

Regarding compliance with the NEPA, Nationwide Programmatic Agreement and NHPA Section 106 for tower co-location, compliance with the Agreement is not required where no new tower construction is being proposed and the tower is not being substantially altered. Specifically, compliance is not necessary where only an antenna and feed-line are being added to the tower as here. However, should the Commission determine compliance is necessary, upon notification to the applicant, the applicant will file FCC Form 621.

CERTIFICATION OF TECHNICAL CONSULTANT: *I declare, under penalty of perjury, that the contents of this report are true and accurate to the best of my knowledge and belief. I further certify I have over nineteen years of experience as a broadcast technical consultant before the Federal Communications Commission ("the FCC"); and am familiar with the Code of Federal Regulations Title 47 ("the Rules") as pertaining to this report and its contents herein. The underlying data utilized in this report was taken directly from FCC databases or indirectly through third party software vendors securing data directly from FCC databases. This firm cannot be held liable for errors or omissions resulting from the underlying data. The information contained herein is believed accurate to the date reported below.*



Justin W. Asher, Technical Consultant

June 16, 2018

NED 03 SEC Terrain Database
US Census 2010 PL Database

Terrain

116

254 m

Exhibit 1

Service Contour Study: Present vs Proposed Operations

Present 60 dBμ F(50:50) Contour

CH221D.A
Fort Worth, TX
BNPFT20180423ABH
Facility ID: 202298
Latitude: 32-48-36 N
Longitude: 097-07-24 W
ERP: 0.25 kW
Channel: 221D (92.1 MHz)
AMSL Height: 242.0 m
Horiz. Pattern: Directional

60 dBμ F(50:50) Contour
Total Population: 338,430
Total Area: 291.7 sq. km

Proposed 60 dBμ F(50:50) Contour

CH221D.P
Fort Worth, TX
Proposed Operation
Facility ID: 202298
Latitude: 32-48-36 N
Longitude: 097-07-24 W
ERP: 0.0005 kW
Channel: 221D (92.1 MHz)
AMSL Height: 179.0 m
Pattern: Directional

60 dBμ F(50:50) Contour
Total Population: 22
Total Area: 2.5 sq. km

Petition to Deny Points

172 W Oak Dr
32-49-18.20 N; 097-10-13.80 W

1209 Sotogrande Blvd
32-49-10.3 N; 97-08-39.7 W

8617 Mystic Trail
32-48-03.0 N; 97-11-30.7 W

2964 Timber Creek Trail
32-48-05.3 N; 97-11-06.3 W

2408 W Abram St
32-43-52.7 N; 97-08-52.1 W

501 Sandpiper Dr
32-43-53.2 N; 97-08-43.7 W

712 Scott Dr
32-44-37.7 N; 97-06-54.9 W

161 Ravenswood Dr
32-50-05.7 N; 97-09-31.2 W

3801 W Euless Blvd
32-48-53.7 N; 97-08-18.5 W

3100 W Euless Blvd
32-49-00.4 N; 97-08-06.9 W

2801W Euless Blvd
32-49-01.8 N; 97-07-49.6 W

2750 W Euless Blvd (1)
32-49-06.8 N; 97-07-48.1 W

2750 W Euless Blvd (2)
32-49-06.8 N; 97-07-48.1 W

1103 Princeton Place
32-49-16.2 N; 97-07-50.2 W

2206 W Euless Blvd
32-49-17.2 N; 97-07-17.6 W

1100 Pamela Dr
32-49-18.60N; 97-06-39.3 W

Asher Broadcast Consulting LLC
justinasher@consultant.com
1 (202) 875-2986

Scale 1:145,000

0 3 6 9 km

Exhibit 2
Service Contour Study:
Proposed vs Primary Operations

Primary 2 mV/m Daytime Contour

25 mile Radius from AM Site

Proposed 60 dBµ F(50:50) Contour

KKGM(AM)
CH221D.P

KKGM 1630 kHz
Fort Worth, Texas
Station Class: B
Region 2 Class: B
Facility ID: 87147
File Number: BL-20060510ACL
32-48-35.7 N 97-07-24.5 W (NAD 27)
32-48-36.2 N 97-07-25.5 W (NAD 83)
Power: 10 kW, Non-Directional
Hours: Daytime
Pattern Type: Theoretical
Towers: 1 Augmentations: 0
Tower Elec Height: 164 Deg; 83.79 m
RMS Theo: 361.6 mV/meter (per kW)
or 1143.48 mV/meter at 10 kW

CH221D.P
Fort Worth, TX
Proposed Operation
Facility ID: 202298
Latitude: 32-48-36 N
Longitude: 097-07-24 W
ERP: 0.0005 kW
Channel: 221D (92.1 MHz)
AMSL Height: 179.0 m
Horiz. Pattern: Directional

NED 03 SEC Terrain Database
US Census 2010 PL Database

Terrain
71 431 m

Scale 1:850,000

0 15 30 45 km

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1 (202) 875-2986

Henderson
V-Soft Communications LLC ©

Exhibit 3

Copy of Existing Antenna Structure Registration

(public record copy)

Registration Detail

Reg Number	1238980	Status	Constructed
File Number	A0782311	Constructed	04/14/2004
EMI	No	Dismantled	
NEPA	No		

Antenna Structure

Structure Type TOWER - Free standing or Guyed Structure used for Commu

Location (in NAD83 Coordinates)

Lat/Long	32-48-36.2 N 097-07-25.5 W	Address	3401 House Anderson Road
City, State	Euless , TX		
Zip	76040	County	TARRANT
Center of AM Array		Position of Tower in Array	

Heights (meters)

Elevation of Site Above Mean Sea Level	Overall Height Above Ground (AGL)
169.2	84.7
Overall Height Above Mean Sea Level	Overall Height Above Ground w/o Appurtenances
253.9	83.8

Painting and Lighting Specifications

FAA Chapters 4, 8, 12
Paint and Light in Accordance with FAA Circular Number 70/7460-1K

FAA Notification

FAA Study	2004-ASW-4858-OE	FAA Issue Date	09/03/2004
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Owner & Contact Information

FRN	0004168829	Owner Entity Type	Corporation
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Owner

Mortenson Broadcasting Company = KKGM
Attention To: C Conner
Financial Center - Key Bank Square
960 West State Street
Alliance , OH 44601

P: (330)829-3944
F:
E: n/a

Contact

same , same
same
same , OH 44601

P: (000)000-0000
F:
E: n/z

Last Action Status

Status	Constructed	Received	08/16/2012
Purpose	Admin Update	Entered	08/16/2012
Mode	Interactive		

Related Applications

08/16/2012	A0782311 - Admin Update (AU)
07/10/2008	A0599168 - Admin Update (AU)
10/29/2004	A0401662 - Notification (NT)

Related applications (6)

Comments

Comments

None

History

Date

08/17/2012
08/17/2012
08/16/2012
All History (14)

Event

Registration Printed
ASR Application receipt letter sent
Administrative Update Received

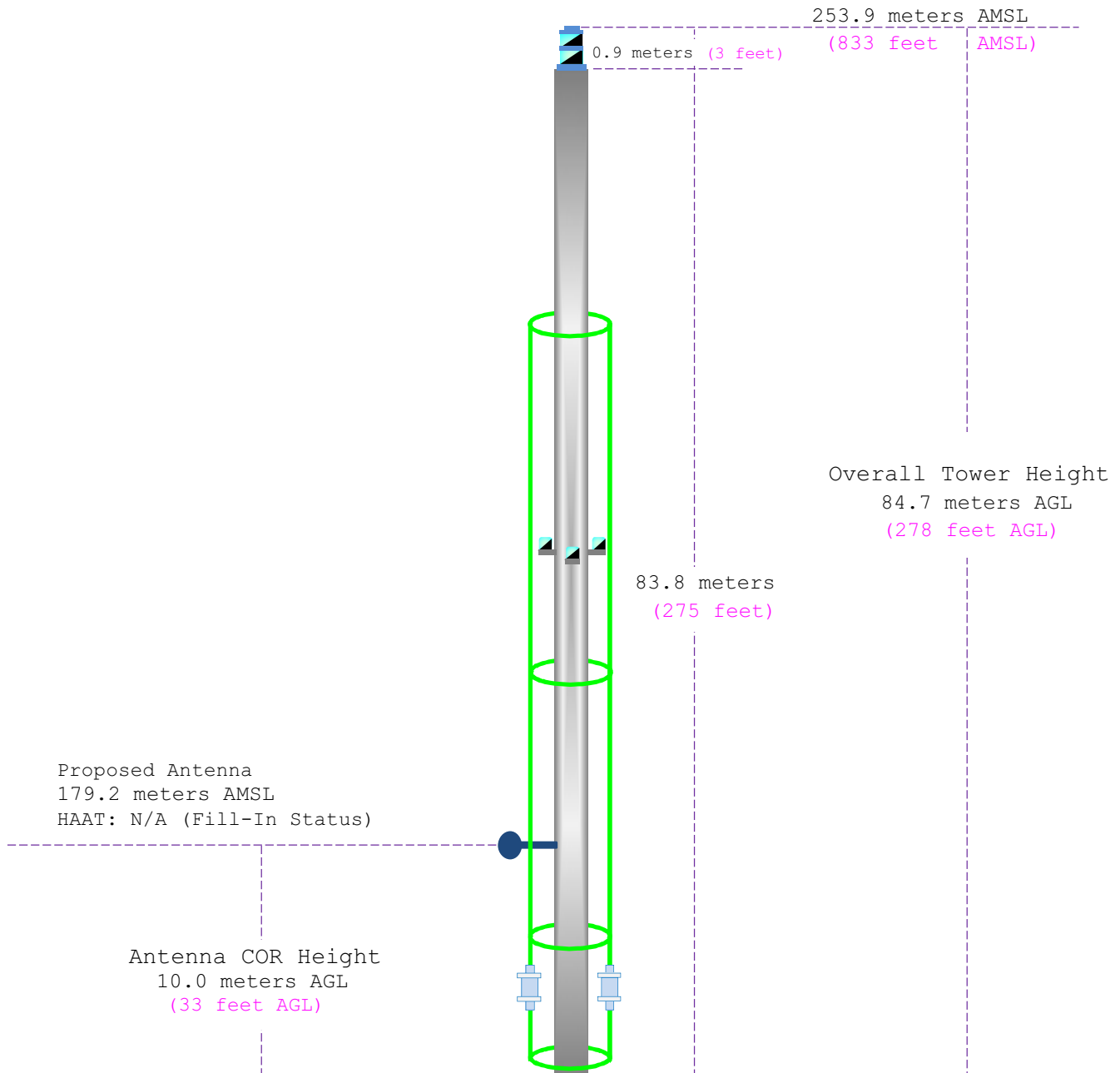
Automated Letters

08/17/2012	Authorization, Reference
08/17/2012	Application Receipt, Reference 724165
07/11/2008	Authorization, Reference

All letters (8)

Exhibit 4

Vertical Plan of Antenna System



Ground Elevation: 169.2 meters AMSL (555 feet AMSL)		
Address: 3401 House Anderson Road		
City: Euless	Latitude (D M S) Longitude (D M S)	
County: Tarrant	NAD 27 datum values: 32 48 35.73510 97 07 24.46126	
State: Texas	NAD 83 datum values: 32 48 36.20000 97 07 25.50000	
Antenna Structure Registration 1238980	Drawing Is Not To Scale	Asher Broadcast Consulting, LLC justinasher@consultant.com 1(202)875-2986

Exhibit 5

HAAT and Miscellaneous Coordinate Information

HAAT Calculation (1927):

N. Lat. = 324836.0 W. Lng. = 970724.0
 HAAT and Distance to Contour,
 FCC, FM 2-10 Mi, 51 pts Method - NED 03 SEC

Azi.	AV EL	HAAT	ERP kW	dBk	Field	60-F5
000	184.3	-5.3	0.0000	-60.97	0.040	0.20
030	177.7	1.3	0.0000	-60.97	0.040	0.20
060	166.5	12.5	0.0000	-53.01	0.100	0.50
090	148.1	30.9	0.0002	-36.11	0.700	1.61
120	152.2	26.8	0.0005	-33.01	1.000	1.61
150	176.8	2.2	0.0002	-36.11	0.700	1.61
180	189.3	-10.3	0.0000	-53.01	0.100	0.50
210	158.9	20.1	0.0000	-60.97	0.040	0.20
240	177.1	1.9	0.0000	-60.97	0.040	0.20
270	168.5	10.5	0.0000	-60.97	0.040	0.20
300	187.5	-8.5	0.0000	-60.97	0.040	0.20
330	191.5	-12.5	0.0000	-60.97	0.040	0.20

Ave El= 173.19 M HAAT= 5.81 M AMSL= 179

NAD 1983 to NAD 1927 Conversion:

	<u>Latitude</u>	<u>Longitude</u>
NAD 27 datum values:	32 48 35.73510	97 07 24.46126
NAD 83 datum values:	32 48 36.20000	97 07 25.50000

Various Coordinate Conversion Calculations (NAD 1983):

Position Type	Lat Lon
Degrees Lat Long	32.8100556°, -097.1237500°
Degrees Minutes	32°48.60333', -097°07.42500'
Degrees Minutes Seconds	32°48'36.2000", -097°07'25.5000"
UTM	14S 675659mE 3631788mN
UTM centimeter	14S 675659.11mE 3631788.79mN
MGRS	14SPB7565931788
Grid North	1.0°
GARS	166LF28
Maidenhead	EM12KT54DJ69
GEOREF	FJHC52574860

Exhibit 6

Tabulation of Proposed Allocation

Blue Text indicates contour protection studies toward select allocation concern(s) as included in **Exhibit(s) 7(a-d)**.

Yellow Text denotes the existence of multiple 47 C.F.R. Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Requests as included in **Exhibit 8**.

Mortenson Broadcasting Company Of Texas, Inc.											
REFERENCE	CH#	221D	-	92.1 MHz,	Pwr= 0.0005 kW	DA,	HAAT= 5.8 M,	COR= 179 M	DISPLAY DATES		
32 48 36.0 N.				Average Protected F(50-50)=	1.61 km				DATA	06-15-18	
97 07 24.0 W.				Standard Directional					SEARCH	06-16-18	
CH CITY	CALL	TYPE STATE	ANT TX	AZI <--	DIST FILE #	LAT LNG	PWR (kW) HAAT (M)	INT (km) COR (M)	PRO (km) LICENSEE	*IN* (Overlap in km)	*OUT*
223C Dallas	KZPS	LIC_C TX		149.4 329.5	28.58 BMLH20060907AAO	32 35 19.0 96 58 05.0	100.000 508	12.9 698	88.8 Amfm Texas Licenses Llc, A	14.1*	-60.3*<
221C1 Glen Rose	KTFW-FM	LIC NCN TX		235.0 54.6	103.15 BLH19990429KC	32 16 31.0 98 01 22.0	25.000 432	159.2 757	69.6 Lkcm Radio Licenses, L.p.	-56.3*<	32.0
219C0 Dallas	KKXT	LIC_C TX		149.2 329.3	29.25 BLED20140903AFT	32 35 02.0 96 57 48.0	19.500 572	7.7 764	74.9 North Texas Public Broadca	19.9*	-45.7*<
221D Fort Worth	1776436	APP DC TX		0.0 0.0	0.00 BNPFT20180125AFJ	32 48 36.0 97 07 24.0	0.250	33.4 242	10.0 Mortenson Broadcasting Com	-33.6*<	-11.6*<
221D Fort Worth	1785601	APP DC TX		0.0 0.0	0.00 BNPFT20180423ABH	32 48 36.0 97 07 24.0	0.001	6.6 242	2.1 Mortenson Broadcasting Com	-6.8*<	-3.8*<
221L1 Dallas	KPVC-LP	LIC TX		84.6 264.8	20.40 BLI20160428AAV	32 49 37.0 96 54 21.0	0.100 30	180	0.2 Iglesia Evangelica Vida Y	11.2	
221A Farmersville	KXEZ	LIC_CX TX		53.4 233.8	87.34 BLH20140915ACP	33 16 33.0 96 22 07.0	1.650 193	83.5 379	29.5 Metro Broadcasters - Texas	3.6	56.3
221L1 Denton	KXDE-LP	LIC TX		1.6 181.6	39.69 BLI20160222AAK	33 10 01.0 97 06 42.0	0.015 77	262	21.4 Mision Templo Bethel Inc.	32.6	
221C1 Marlow	KFXI	LIC_CX OK		338.6 158.1	223.78 BLH20080731AIK	34 40 50.0 98 01 02.0	100.000 166	156.5 537	59.7 Dfwu, Inc.	67.1	162.5
222D Gainesville	K222DD	CP_C TX		0.9 180.9	90.99 BNPFT20180418AEN	33 37 42.0 97 06 27.0	0.250	19.1 304	12.8 First Iv Media, Inc	71.7	77.8
221C3 Tyler	KRWR	LIC NCX TX		105.1 286.1	180.25 BLH20160330AQV	32 22 30.2 95 16 10.2	9.800 130	100.3 274	36.4 Gleiser Communications, Ll	78.2	138.5
221D Mexia	K221FI	CP_C TX		155.3 335.5	91.91 BPFT20180418ADC	32 03 30.0 96 42 56.0	0.009	10.8 187	3.4 Templo De Dios, Inc. 1	79.5	84.9
221D Mexia	K221FI	LIC_C TX		154.5 334.7	97.86 BLFT20180326AAY	32 00 54.0 96 40 33.0	0.004	8.0 174	2.5 Templo De Dios, Inc. 1	88.3	91.6
222D Bowie	K222AW	LIC_C TX		320.7 140.3	107.07 BLFT20150309AGU	33 33 10.0 97 51 21.0	0.190	17.2 401	11.8 Educational Media Foundati	89.7	94.9
220C3 Archer City	KPMA-FM«	LIC NCX TX		300.0 119.2	142.86 BLED20110509ADS	33 26 38.0 98 27 22.0	25.000 55	52.8 381	32.6 Templo De Dios, Inc. 1	48.5R	94.4M

Terrain database is NED 03 SEC , R= 73.215 qualifying spacings or FCC minimum Spacings in KM, M= Margin in KM
 Contour distances are on direct line to and from reference station. Reference zone= West Zone, Co to 3rd adjacent.
 All separation margins (if shown) include rounding.
 Ant Column: (D= DA Standard, Z= DA 73.215, N= Not DA 73.215, _= Omni), Polarization (C,H,V,E), Beamtilt(Y,N,X)
 ""affixed to 'IN' or 'OUT' values = site inside restricted contour.
 < = Contour Overlap
 Reference station has protected zone issue: AM tower

Exhibit 7a
Contour Protection Studies Toward Select Allocation Concern(s)

Mortenson Broadcasting Company Of Texas, Inc.

FMCommander Single Allocation Study - 06-16-2018 - NED 03 SEC
CH221D.P's Overlaps (In= -56.27 km, Out= 31.99 km)

CH221D.P CH 221 D DA
Lat= 32 48 36.0, Lng= 97 07 24.0
0.0005 kW 5.8 m HAAT, 179 m COR
Prot.= 60 dBu, Intef.= 40 dBu

KTFW-FM CH 221 C1 73.215 N BLH19990429KC
Lat= 32 16 31.0, Lng= 98 01 22.0
25.0 kW 432 m HAAT, 757 m COR
Prot.= 60 dBu, Intef.= 40 dBu

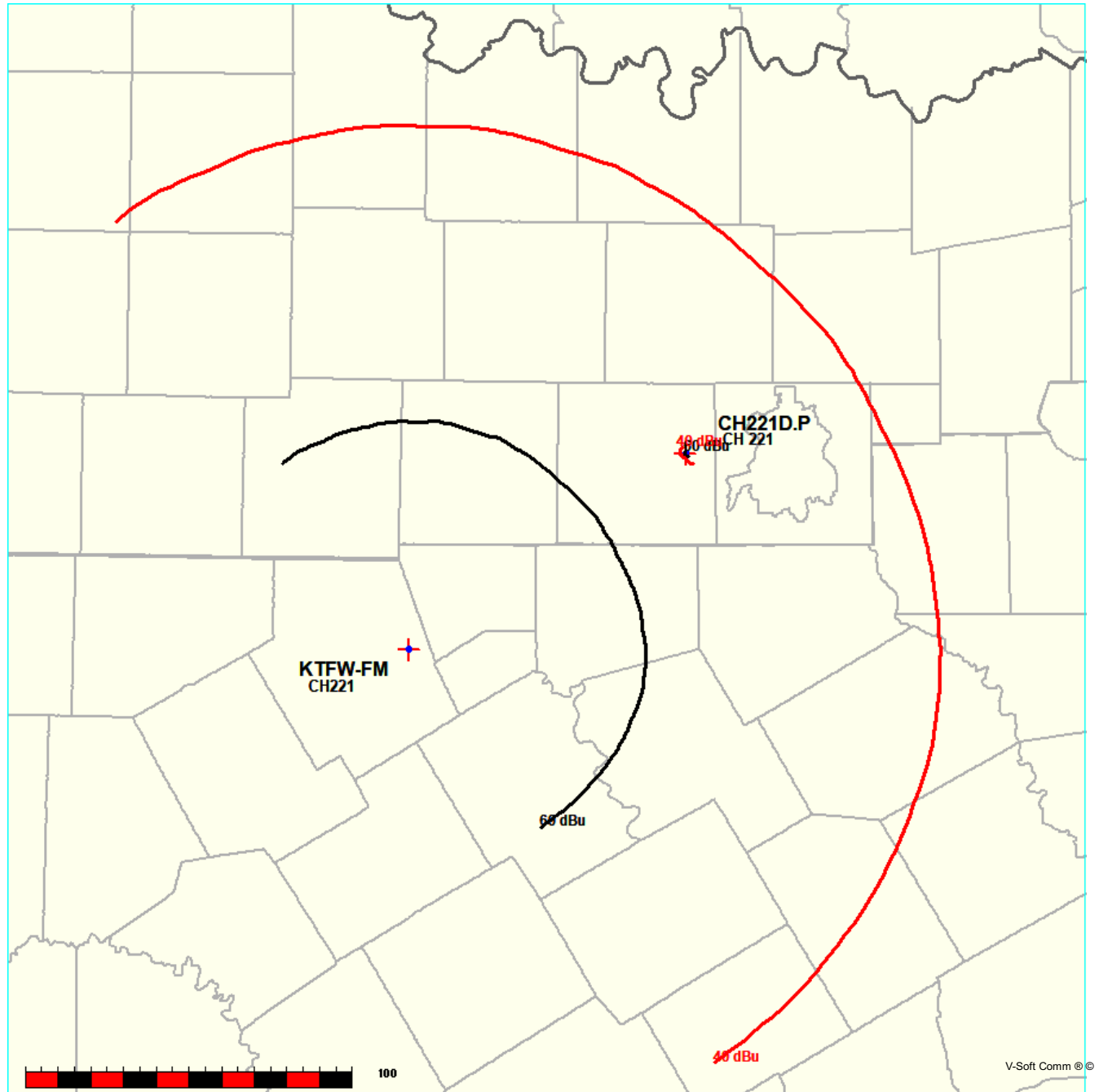


Exhibit 7b

Contour Protection Studies Toward Select Allocation Concern(s)

Mortenson Broadcasting Company Of Texas, Inc.

FMCommander Single Allocation Study - 06-16-2018 - NED 03 SEC
CH221D.P's Overlaps (In= 0.22 km, Out= 11.15 km)

CH221D.P CH 221 D DA
Lat= 32 48 36.0, Lng= 97 07 24.0
0.0005 kW 5.8 m HAAT, 179 m COR
Prot.= 60 dBu, Intef.= 40 dBu

KPVC-LP CH 221 L1 BLL20160428AAV
Lat= 32 49 37.0, Lng= 96 54 21.0
0.1 kW 30.44044 m HAAT, 180 m COR
Prot.= 60 dBu, Intef.= 40 dBu

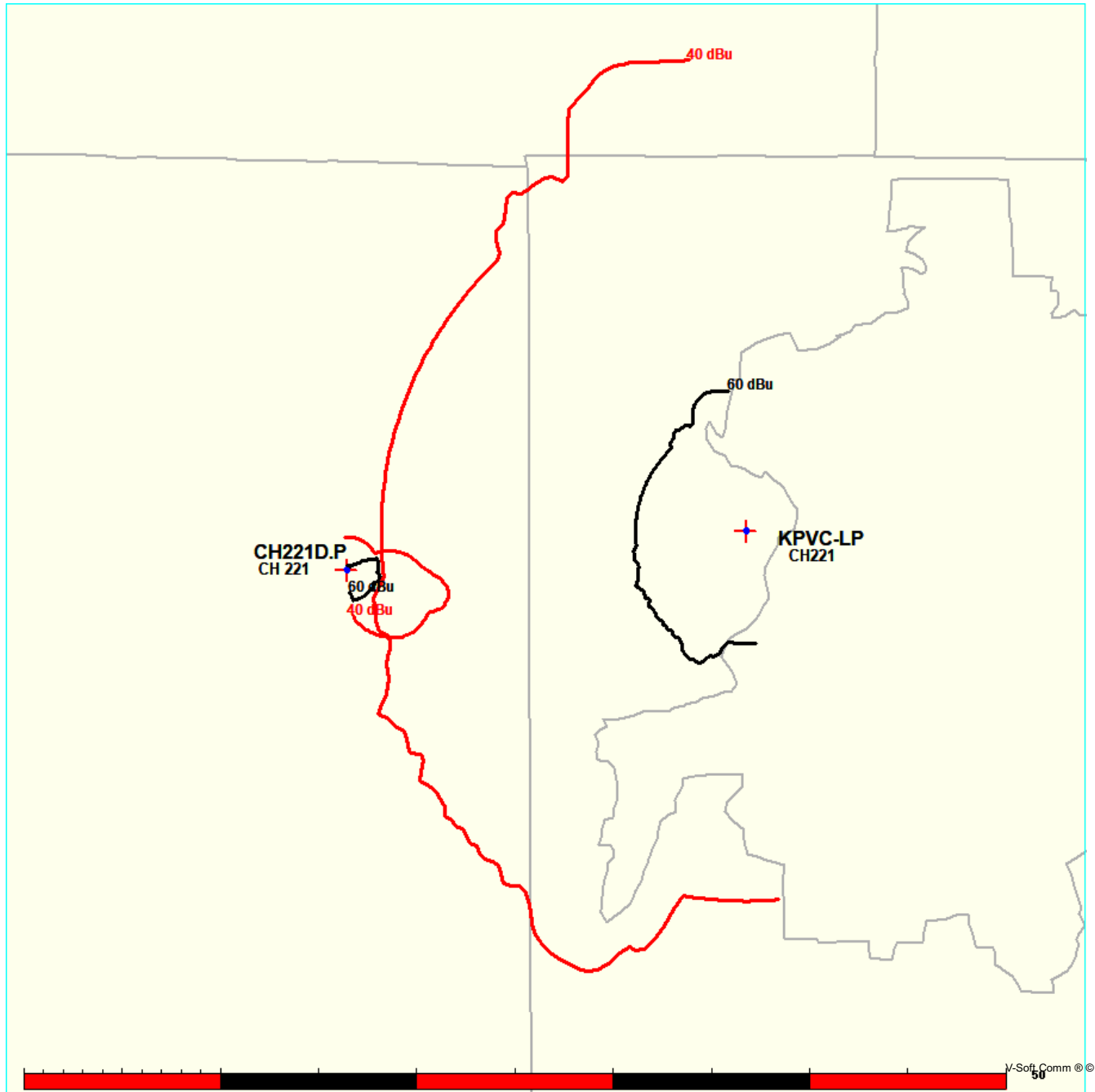


Exhibit 7c
Contour Protection Studies Toward Select Allocation Concern(s)

Mortenson Broadcasting Company Of Texas, Inc.

FMCommander Single Allocation Study - 06-16-2018 - NED 03 SEC
CH221D.P's Overlaps (In= 3.56 km, Out= 56.25 km)

CH221D.P CH 221 D DA
Lat= 32 48 36.0, Lng= 97 07 24.0
0.0005 kW 5.8 m HAAT, 179 m COR
Prot.= 60 dBu, Intef.= 40 dBu

KXEZ CH 221 A BLH20140915ACP
Lat= 33 16 33.0, Lng= 96 22 07.0
1.65 kW 193 m HAAT, 379 m COR
Prot.= 60 dBu, Intef.= 40 dBu

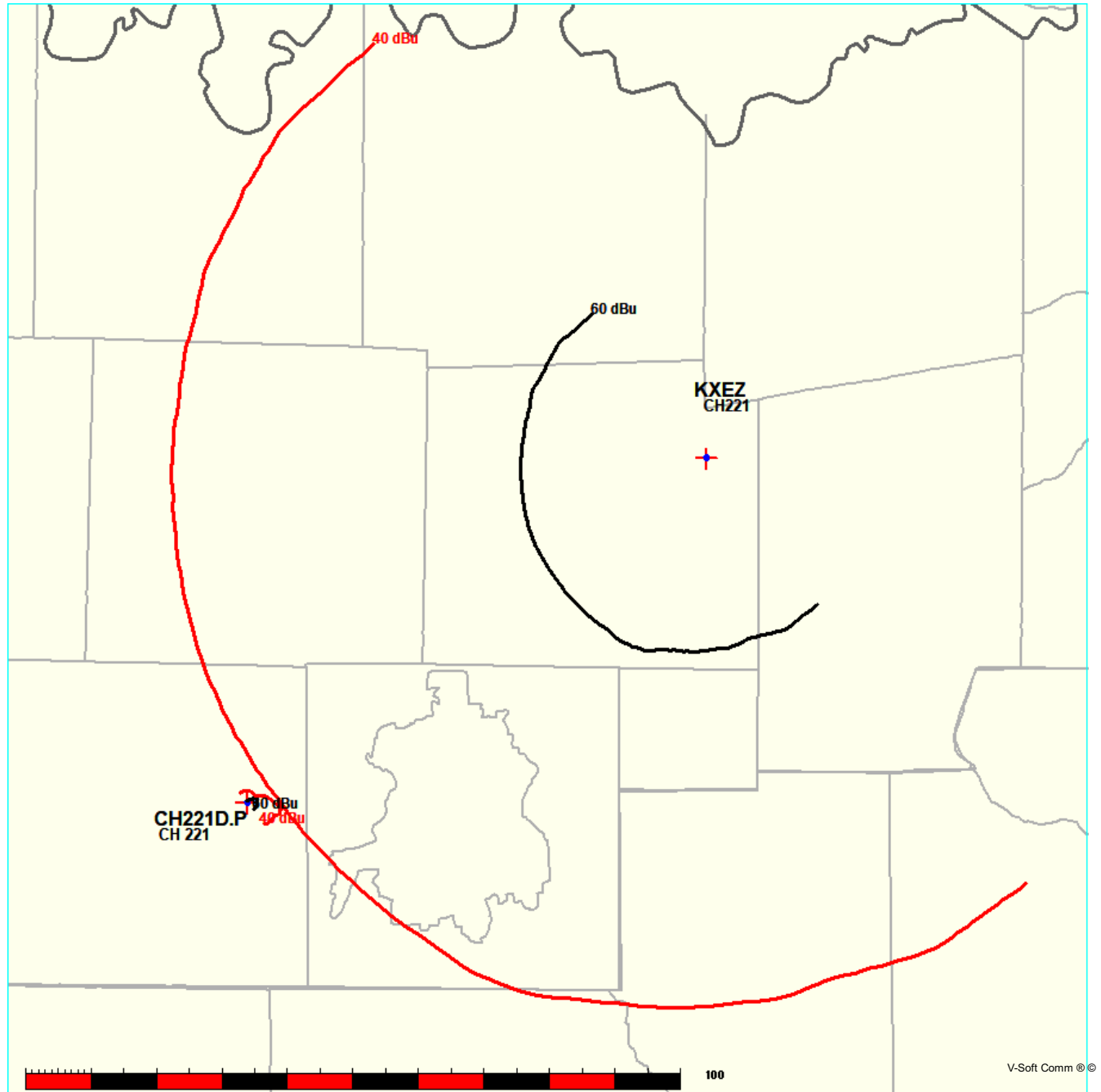


Exhibit 7d

Contour Protection Studies Toward Select Allocation Concern(s)

Mortenson Broadcasting Company Of Texas, Inc.

FMCommander Single Allocation Study - 06-16-2018 - NED 03 SEC

CH221D.P's Overlaps (In= 21.44 km, Out= 32.57 km)

CH221D.P CH 221 D DA

Lat= 32 48 36.0, Lng= 97 07 24.0

0.0005 kW 5.8 m HAAT, 179 m COR

Prot.= 60 dBu, Intef.= 40 dBu

KXDE-LP CH 221 L1 BLL20160222AAK

Lat= 33 10 01.0, Lng= 97 06 42.0

0.015 kW 76.5 m HAAT, 262 m COR

Prot.= 60 dBu, Intef.= 40 dBu

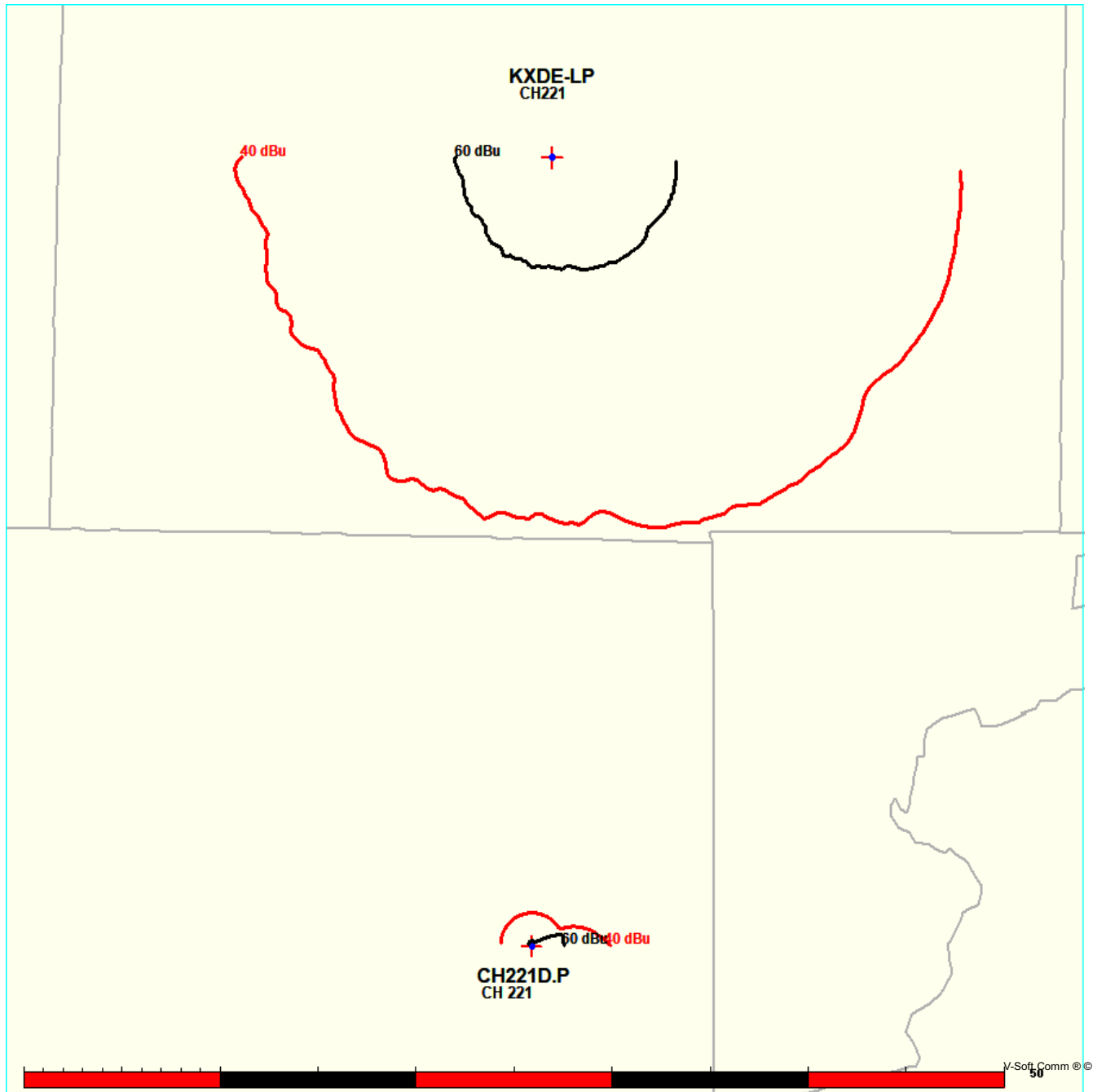
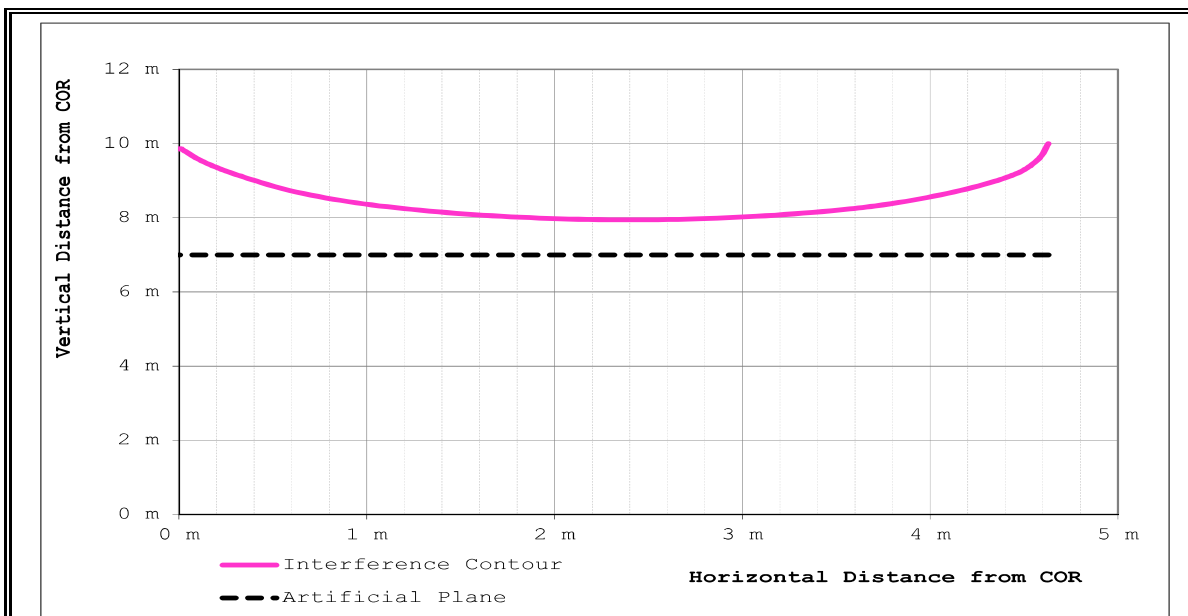
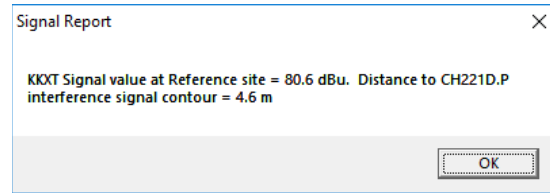
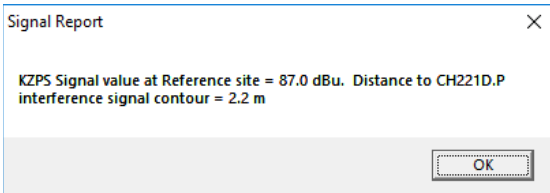


Exhibit 8

47 C.F.R. Section 74.1204(d) Second / Third Adjacent Given Interference Waiver Request

Yellow Highlighted Text denotes the existence of a 47 C.F.R. Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Request toward KZPS(FM) - Dallas, TX (CH223C) and KKXT(FM) - Dallas, TX (CH219C0) as noted in **Exhibit 8**. Protection of the worst case calculated 120.6 dBμ F(50:10) Interference Contour, corresponding to the worst case calculated 80.6 dBμ F(50:50) Protected Contour, has been demonstrated through a downward radiation study. Full protection will be afforded each facility as this area will not reach the ground nor a seven meter artificial plane representing a standard two story house when taking into account the downward radiation characteristics of the antenna as supplied by the antenna manufacturer. A copy of the antenna manufacturer specifications has been included in **Exhibit 9**.



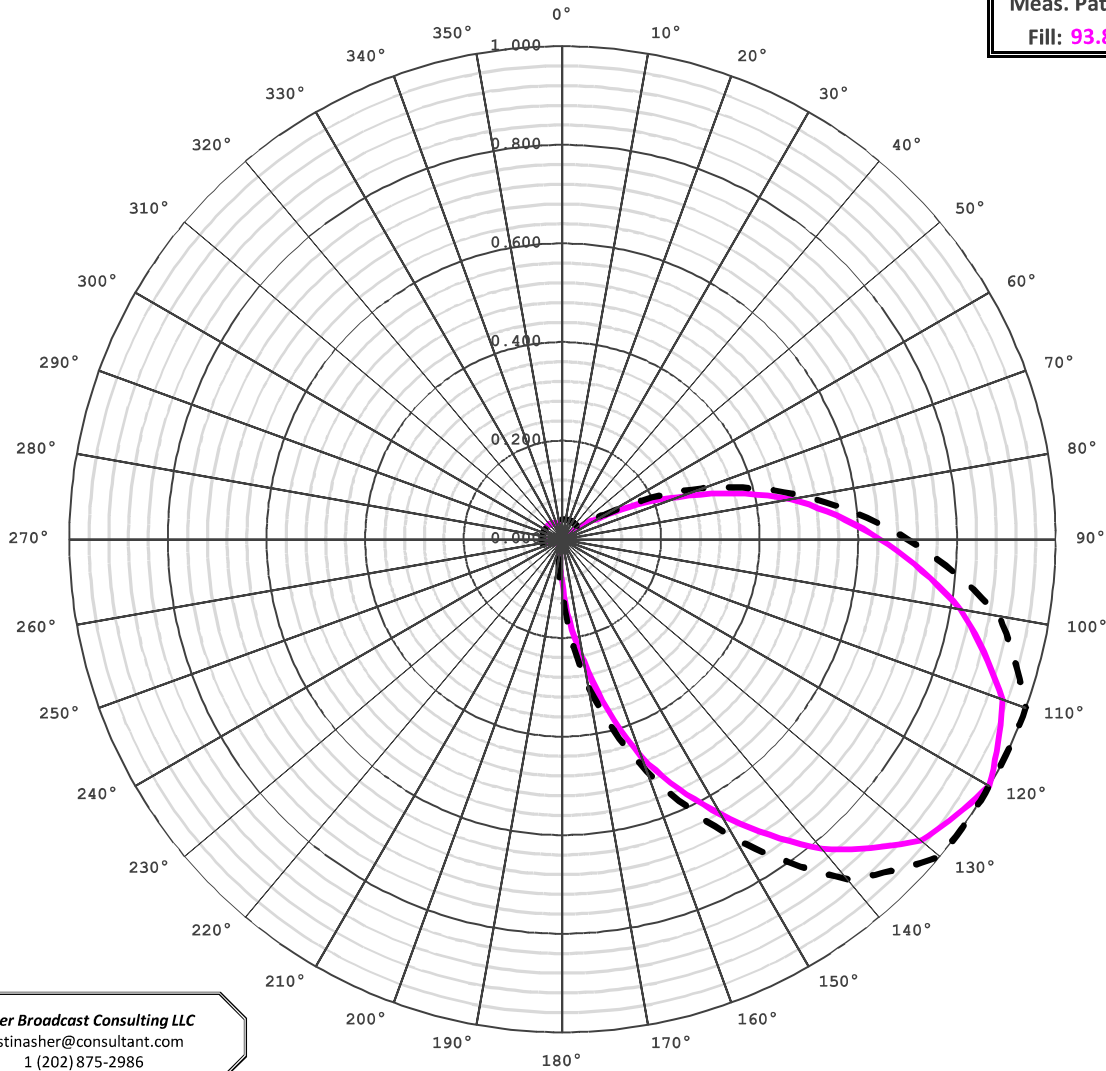
Proposed Antenna: Kathrein CL-FM(Horizontal) (1-Bay) Proposed Power: 0.0005 kW Antenna Height AGL: 10.0 meters Protection Plane Height: 7.0 meters Protected Contour: 80.60 dBμ F(50:50) Interference Contour: 120.60 dBμ F(50:50)					Field Strength (dBμ) Equation $106.92 - (20 * (\text{LOG10}[\text{DistMeters}] / 1000)) + [\text{ERP in dBk}]$ Distance (Free Space) Equation: $(10^{((106.92 - [\text{desired dBμ}] + [\text{ERP in dBk}]) / 20)) * 1000}$			
Angle Below Horizon	Vertical Antenna Properties Relative Field	ERP in kW	ERP in dBk	Meters from Antenna to Int. Contour	Meters from Antenna to Artificial Plane	Meters from Antenna to Ground Level	Field Strength at Protection Plane (dBμ)	Field Strength at Ground Level (dBμ)
0°	1.000	0.001	-33.01	4.63 m				
-5°	0.993	0.000	-33.07	4.60 m	34.42 m	114.74 m	103.11 dBμ	92.65 dBμ
-10°	0.980	0.000	-33.19	4.54 m	17.28 m	57.59 m	108.99 dBμ	98.53 dBμ
-15°	0.952	0.000	-33.44	4.41 m	11.59 m	38.64 m	112.20 dBμ	101.74 dBμ
-20°	0.916	0.000	-33.77	4.24 m	8.77 m	29.24 m	114.29 dBμ	103.83 dBμ
-25°	0.873	0.000	-34.19	4.04 m	7.10 m	23.66 m	115.71 dBμ	105.25 dBμ
-30°	0.817	0.000	-34.77	3.78 m	6.00 m	20.00 m	116.59 dBμ	106.13 dBμ
-35°	0.756	0.000	-35.44	3.50 m	5.23 m	17.43 m	117.11 dBμ	106.65 dBμ
-40°	0.690	0.000	-36.23	3.19 m	4.67 m	15.56 m	117.31 dBμ	106.85 dBμ
-45°	0.618	0.000	-37.19	2.86 m	4.24 m	14.14 m	117.18 dBμ	106.72 dBμ
-50°	0.544	0.000	-38.30	2.52 m	3.92 m	13.05 m	116.76 dBμ	106.31 dBμ
-55°	0.467	0.000	-39.62	2.16 m	3.66 m	12.21 m	116.02 dBμ	105.56 dBμ
-60°	0.390	0.000	-41.19	1.81 m	3.46 m	11.55 m	114.94 dBμ	104.48 dBμ
-65°	0.300	0.000	-43.47	1.39 m	3.31 m	11.03 m	113.06 dBμ	102.60 dBμ
-70°	0.190	0.000	-47.44	0.88 m	3.19 m	10.64 m	109.40 dBμ	98.94 dBμ
-75°	0.110	0.000	-52.18	0.51 m	3.11 m	10.35 m	104.89 dBμ	94.44 dBμ
-80°	0.050	0.000	-59.03	0.23 m	3.05 m	10.15 m	98.21 dBμ	87.76 dBμ
-85°	0.030	0.000	-63.47	0.14 m	3.01 m	10.04 m	93.88 dBμ	83.42 dBμ
-90°	0.030	0.000	-63.47	0.14 m	3.00 m	10.00 m	93.91 dBμ	83.45 dBμ

Manufacturer's	Make/Model	Orientation	Power
Element 1:	CI-FM(Horizontal Only)	120° True	100.0%
Element 2:			
Element 3:			
Element 4:			

Composite Power: 100%

Exhibit 9 - Copy of Manufacturer's Directional Antenna Pattern Data

Meas. Pattern
Fill: 93.8%



Azimuth ° True	FCC Pattern	Manufacturer's Pattern
0°	0.040	0.015
10°	0.040	0.010
20°	0.040	0.010
30°	0.040	0.010
40°	0.040	0.010
50°	0.040	0.020
60°	0.100	0.085
70°	0.300	0.250
80°	0.500	0.470
90°	0.700	0.645
100°	0.900	0.820
110°	1.000	0.950
120°	1.000	1.000
130°	1.000	0.950
140°	0.900	0.820
150°	0.700	0.645
160°	0.500	0.470
170°	0.300	0.250
180°	0.100	0.085
190°	0.040	0.020
200°	0.040	0.010
210°	0.040	0.010
220°	0.040	0.010
230°	0.040	0.010
240°	0.040	0.015
250°	0.040	0.025
260°	0.040	0.034
270°	0.040	0.038
280°	0.040	0.040
290°	0.040	0.040
300°	0.040	0.040
310°	0.040	0.040
320°	0.040	0.040
330°	0.040	0.038
340°	0.040	0.034
350°	0.040	0.025

Asher Broadcast Consulting LLC
justinasher@consultant.com
1 (202) 875-2986

FCC Pattern: ---
Manufacturer's Pattern: ———

Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Elements rotated to 120.0°T) (public record copy)



CL-FM FM LOG-PERIODIC ANTENNA 7 dBd gain 88–108 MHz

The Kathrein Scala Division CL-FM is a ruggedly built log-periodic antenna, designed for professional FM transmit and receive applications.

Like all Kathrein Scala Division antennas, the CL-FM is made of the finest materials using state of the art electrical and mechanical designs, resulting in superior performance and long service life.

The CL-FM may be used stand-alone or in stacked arrays for higher gain, increased side-lobe suppression, or custom azimuth patterns.

Specifications:

Frequency range	88–108 MHz (broadband)
Gain	7 dBd
Impedance	50 or 75 ohms
VSWR	< 1.5:1
Polarization	Horizontal or vertical
Front-to-back ratio	>25 dB
Maximum input power	250 watts, type "N" 75 ohm connector 500 watts, type "N" 50 ohm connector
Azimuth pattern	52 degrees (half-power) horizontal polarization
Elevation pattern	78 degrees (half-power) horizontal polarization
Connector	Female 50Ω or 75Ω N
Weight	45 lb (20.4 kg)
Dimensions	104 x 67.9 inches (2642 x 1724 mm)

Equivalent flat plate area

CL-FM/HCM	5.31 ft ² (0.494 m ²)
CL-FM/HRM	5.86 ft ² (0.544 m ²)
CL-FM/VRM	5.86 ft ² (0.544 m ²)

Wind survival rating*	120 mph (200 kph)
Shipping dimensions	116 x 14.5 x 6 inches (2946 x 369 x 153 mm)
Shipping weight	56 lb (25.4 kg)
Mounting	For masts of 2.375 inches (60 mm) OD.

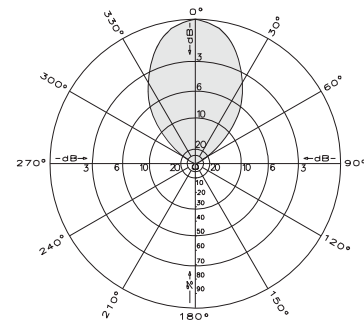
CL-FM/HCM	Horizontal polarization center-mount
CL-FM/HRM	Horizontal polarization rear-mount
CL-FM/VRM	Vertical polarization rear-mount

See reverse for order information.

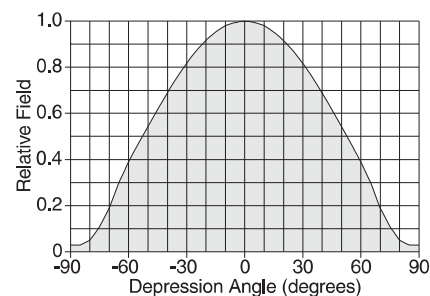
* Mechanical design is based on environmental conditions as stipulated in EIA-222-F (June 1996) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.



10492-D



Azimuth pattern (E-plane)



Elevation pattern (H-plane)

Exhibit 9

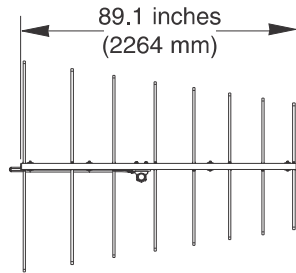
Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Elements rotated to 120.0°T) (public record copy)

CL-FM

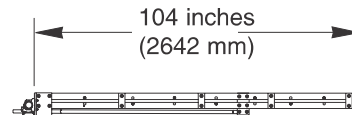
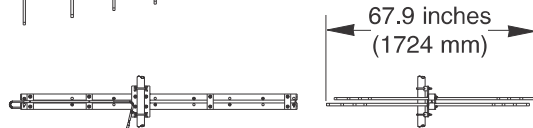
FM LOG-PERIODIC ANTENNA

7 dBd gain

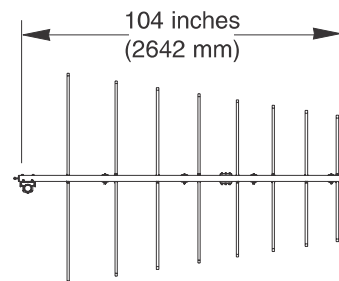
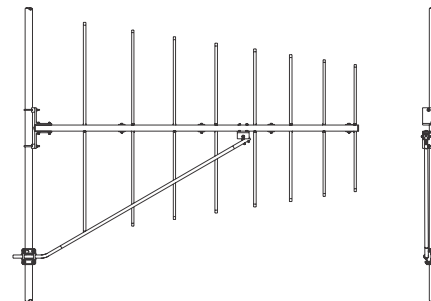
88–108 MHz



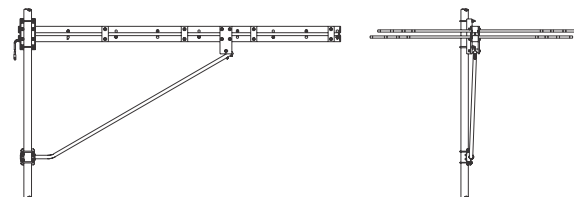
CL-FM/HCM
Horizontally polarized



CL-FM/VRM
Vertically polarized



CL-FM/HRM
Horizontally polarized



Vertically polarized antennas require lateral stabilization (not supplied) to prevent the antenna from turning on the mounting pipe.

Order Information:

Model	Description
CL-FM/HCM/50N	Antenna with 50Ω N connector Horizontal polarization center-mount
CL-FM/HCM/75N	Antenna with 75Ω N connector Horizontal polarization center-mount
CL-FM/HRM/50N	Antenna with 50Ω N connector Horizontal polarization rear-mount

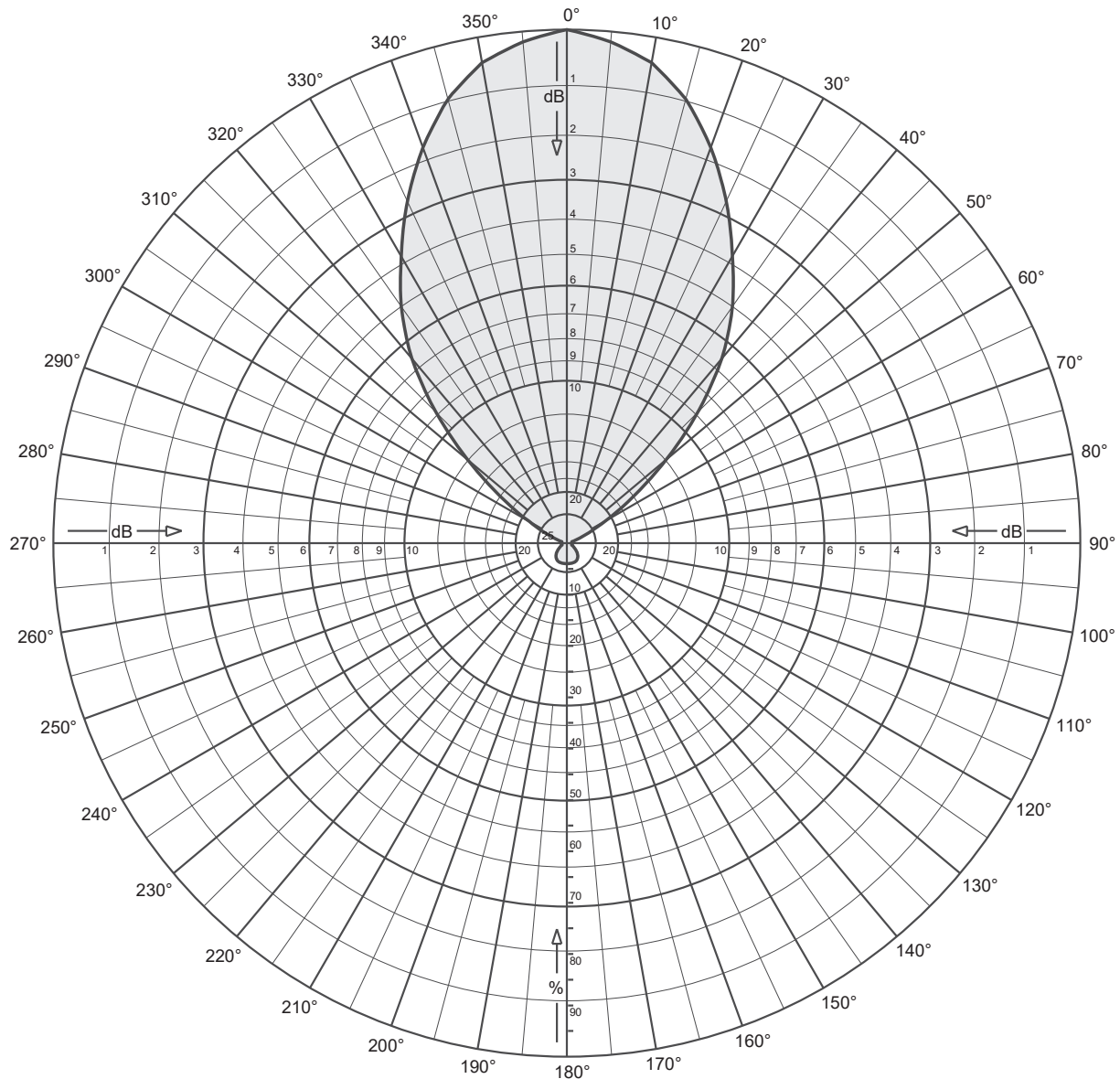
Order Information:

Model	Description
CL-FM/HRM/75N	Antenna with 75Ω N connector Horizontal polarization rear-mount
CL-FM/VRM/50N	Antenna with 50Ω N connector Vertical polarization rear-mount
CL-FM/VRM/75N	Antenna with 75Ω N connector Vertical polarization rear-mount

All specifications are subject to change without notice

Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Elements rotated to 120.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Horizontal polarization Component

Horizontal radiation pattern

0 degree electrical downtilt



Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Elements rotated to 120.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Horizontal polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
0	1.000	0.00	7.00	5.01	45	0.360	-8.87	-1.87	0.65
1	0.996	-0.03	6.97	4.97	46	0.338	-9.42	-2.42	0.57
2	0.992	-0.07	6.93	4.93	47	0.316	-10.01	-3.01	0.50
3	0.988	-0.10	6.90	4.89	48	0.294	-10.63	-3.63	0.43
4	0.984	-0.14	6.86	4.85	49	0.272	-11.31	-4.31	0.37
5	0.980	-0.18	6.82	4.81	50	0.250	-12.04	-5.04	0.31
6	0.974	-0.23	6.77	4.75	51	0.231	-12.73	-5.73	0.27
7	0.968	-0.28	6.72	4.70	52	0.212	-13.47	-6.47	0.23
8	0.962	-0.34	6.66	4.64	53	0.193	-14.29	-7.29	0.19
9	0.956	-0.39	6.61	4.58	54	0.174	-15.19	-8.19	0.15
10	0.950	-0.45	6.55	4.52	55	0.155	-16.19	-9.19	0.12
11	0.939	-0.55	6.45	4.42	56	0.141	-17.02	-10.02	0.10
12	0.928	-0.65	6.35	4.32	57	0.127	-17.92	-10.92	0.08
13	0.917	-0.75	6.25	4.21	58	0.113	-18.94	-11.94	0.06
14	0.906	-0.86	6.14	4.11	59	0.099	-20.09	-13.09	0.05
15	0.895	-0.96	6.04	4.01	60	0.085	-21.41	-14.41	0.04
16	0.880	-1.11	5.89	3.88	61	0.077	-22.27	-15.27	0.03
17	0.865	-1.26	5.74	3.75	62	0.069	-23.22	-16.22	0.02
18	0.850	-1.41	5.59	3.62	63	0.061	-24.29	-17.29	0.02
19	0.835	-1.57	5.43	3.49	64	0.053	-25.51	-18.51	0.01
20	0.820	-1.72	5.28	3.37	65	0.045	-26.94	-19.94	0.01
21	0.803	-1.91	5.09	3.23	66	0.040	-27.96	-20.96	0.01
22	0.786	-2.09	4.91	3.10	67	0.035	-29.12	-22.12	0.01
23	0.769	-2.28	4.72	2.96	68	0.030	-30.46	-23.46	0.00
24	0.752	-2.48	4.52	2.83	69	0.025	-32.04	-25.04	0.00
25	0.735	-2.67	4.33	2.71	70	0.020	-33.98	-26.98	0.00
26	0.717	-2.89	4.11	2.58	71	0.018	-34.89	-27.89	0.00
27	0.699	-3.11	3.89	2.45	72	0.016	-35.92	-28.92	0.00
28	0.681	-3.34	3.66	2.32	73	0.014	-37.08	-30.08	0.00
29	0.663	-3.57	3.43	2.20	74	0.012	-38.42	-31.42	0.00
30	0.645	-3.81	3.19	2.09	75	0.010	-40.00	-33.00	0.00
31	0.628	-4.03	2.97	1.98	76	0.010	-40.00	-33.00	0.00
32	0.612	-4.26	2.74	1.88	77	0.010	-40.00	-33.00	0.00
33	0.595	-4.50	2.50	1.78	78	0.010	-40.00	-33.00	0.00
34	0.579	-4.75	2.25	1.68	79	0.010	-40.00	-33.00	0.00
35	0.562	-5.00	2.00	1.59	80	0.010	-40.00	-33.00	0.00
36	0.544	-5.29	1.71	1.48	81	0.010	-40.00	-33.00	0.00
37	0.525	-5.59	1.41	1.38	82	0.010	-40.00	-33.00	0.00
38	0.507	-5.90	1.10	1.29	83	0.010	-40.00	-33.00	0.00
39	0.488	-6.22	0.78	1.20	84	0.010	-40.00	-33.00	0.00
40	0.470	-6.56	0.44	1.11	85	0.010	-40.00	-33.00	0.00
41	0.448	-6.97	0.03	1.01	86	0.010	-40.00	-33.00	0.00
42	0.426	-7.41	-0.41	0.91	87	0.010	-40.00	-33.00	0.00
43	0.404	-7.87	-0.87	0.82	88	0.010	-40.00	-33.00	0.00
44	0.382	-8.36	-1.36	0.73	89	0.010	-40.00	-33.00	0.00

Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Elements rotated to 120.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Horizontal polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
90	0.010	-40.00	-33.00	0.00	135	0.029	-30.75	-23.75	0.00
91	0.010	-40.00	-33.00	0.00	136	0.030	-30.49	-23.49	0.00
92	0.010	-40.00	-33.00	0.00	137	0.031	-30.23	-23.23	0.00
93	0.010	-40.00	-33.00	0.00	138	0.032	-29.98	-22.98	0.01
94	0.010	-40.00	-33.00	0.00	139	0.033	-29.74	-22.74	0.01
95	0.010	-40.00	-33.00	0.00	140	0.034	-29.50	-22.50	0.01
96	0.010	-40.00	-33.00	0.00	141	0.034	-29.37	-22.37	0.01
97	0.010	-40.00	-33.00	0.00	142	0.034	-29.24	-22.24	0.01
98	0.010	-40.00	-33.00	0.00	143	0.035	-29.12	-22.12	0.01
99	0.010	-40.00	-33.00	0.00	144	0.036	-29.00	-22.00	0.01
100	0.010	-40.00	-33.00	0.00	145	0.036	-28.87	-21.87	0.01
101	0.010	-40.00	-33.00	0.00	146	0.036	-28.75	-21.75	0.01
102	0.010	-40.00	-33.00	0.00	147	0.037	-28.64	-21.64	0.01
103	0.010	-40.00	-33.00	0.00	148	0.038	-28.52	-21.52	0.01
104	0.010	-40.00	-33.00	0.00	149	0.038	-28.40	-21.40	0.01
105	0.010	-40.00	-33.00	0.00	150	0.038	-28.29	-21.29	0.01
106	0.010	-40.00	-33.00	0.00	151	0.039	-28.25	-21.25	0.01
107	0.010	-40.00	-33.00	0.00	152	0.039	-28.20	-21.20	0.01
108	0.010	-40.00	-33.00	0.00	153	0.039	-28.16	-21.16	0.01
109	0.010	-40.00	-33.00	0.00	154	0.039	-28.11	-21.11	0.01
110	0.010	-40.00	-33.00	0.00	155	0.039	-28.07	-21.07	0.01
111	0.010	-39.58	-32.58	0.00	156	0.040	-28.05	-21.05	0.01
112	0.011	-39.17	-32.17	0.00	157	0.040	-28.02	-21.02	0.01
113	0.012	-38.79	-31.79	0.00	158	0.040	-28.00	-21.00	0.01
114	0.012	-38.42	-31.42	0.00	159	0.040	-27.98	-20.98	0.01
115	0.012	-38.06	-31.06	0.00	160	0.040	-27.96	-20.96	0.01
116	0.013	-37.72	-30.72	0.00	161	0.040	-27.96	-20.96	0.01
117	0.013	-37.39	-30.39	0.00	162	0.040	-27.96	-20.96	0.01
118	0.014	-37.08	-30.08	0.00	163	0.040	-27.96	-20.96	0.01
119	0.014	-36.77	-29.77	0.00	164	0.040	-27.96	-20.96	0.01
120	0.015	-36.48	-29.48	0.00	165	0.040	-27.96	-20.96	0.01
121	0.016	-35.92	-28.92	0.00	166	0.040	-27.96	-20.96	0.01
122	0.017	-35.39	-28.39	0.00	167	0.040	-27.96	-20.96	0.01
123	0.018	-34.89	-27.89	0.00	168	0.040	-27.96	-20.96	0.01
124	0.019	-34.42	-27.42	0.00	169	0.040	-27.96	-20.96	0.01
125	0.020	-33.98	-26.98	0.00	170	0.040	-27.96	-20.96	0.01
126	0.021	-33.56	-26.56	0.00	171	0.040	-27.96	-20.96	0.01
127	0.022	-33.15	-26.15	0.00	172	0.040	-27.96	-20.96	0.01
128	0.023	-32.77	-25.77	0.00	173	0.040	-27.96	-20.96	0.01
129	0.024	-32.40	-25.40	0.00	174	0.040	-27.96	-20.96	0.01
130	0.025	-32.04	-25.04	0.00	175	0.040	-27.96	-20.96	0.01
131	0.026	-31.77	-24.77	0.00	176	0.040	-27.96	-20.96	0.01
132	0.027	-31.50	-24.50	0.00	177	0.040	-27.96	-20.96	0.01
133	0.027	-31.24	-24.24	0.00	178	0.040	-27.96	-20.96	0.01
134	0.028	-31.00	-24.00	0.00	179	0.040	-27.96	-20.96	0.01

Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Elements rotated to 120.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Horizontal polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
180	0.040	-27.96	-20.96	0.01	225	0.029	-30.75	-23.75	0.00
181	0.040	-27.96	-20.96	0.01	226	0.028	-31.00	-24.00	0.00
182	0.040	-27.96	-20.96	0.01	227	0.027	-31.24	-24.24	0.00
183	0.040	-27.96	-20.96	0.01	228	0.027	-31.50	-24.50	0.00
184	0.040	-27.96	-20.96	0.01	229	0.026	-31.77	-24.77	0.00
185	0.040	-27.96	-20.96	0.01	230	0.025	-32.04	-25.04	0.00
186	0.040	-27.96	-20.96	0.01	231	0.024	-32.40	-25.40	0.00
187	0.040	-27.96	-20.96	0.01	232	0.023	-32.77	-25.77	0.00
188	0.040	-27.96	-20.96	0.01	233	0.022	-33.15	-26.15	0.00
189	0.040	-27.96	-20.96	0.01	234	0.021	-33.56	-26.56	0.00
190	0.040	-27.96	-20.96	0.01	235	0.020	-33.98	-26.98	0.00
191	0.040	-27.96	-20.96	0.01	236	0.019	-34.42	-27.42	0.00
192	0.040	-27.96	-20.96	0.01	237	0.018	-34.89	-27.89	0.00
193	0.040	-27.96	-20.96	0.01	238	0.017	-35.39	-28.39	0.00
194	0.040	-27.96	-20.96	0.01	239	0.016	-35.92	-28.92	0.00
195	0.040	-27.96	-20.96	0.01	240	0.015	-36.48	-29.48	0.00
196	0.040	-27.96	-20.96	0.01	241	0.014	-36.77	-29.77	0.00
197	0.040	-27.96	-20.96	0.01	242	0.014	-37.08	-30.08	0.00
198	0.040	-27.96	-20.96	0.01	243	0.013	-37.39	-30.39	0.00
199	0.040	-27.96	-20.96	0.01	244	0.013	-37.72	-30.72	0.00
200	0.040	-27.96	-20.96	0.01	245	0.012	-38.06	-31.06	0.00
201	0.040	-27.98	-20.98	0.01	246	0.012	-38.42	-31.42	0.00
202	0.040	-28.00	-21.00	0.01	247	0.012	-38.79	-31.79	0.00
203	0.040	-28.02	-21.02	0.01	248	0.011	-39.17	-32.17	0.00
204	0.040	-28.05	-21.05	0.01	249	0.010	-39.58	-32.58	0.00
205	0.039	-28.07	-21.07	0.01	250	0.010	-40.00	-33.00	0.00
206	0.039	-28.11	-21.11	0.01	251	0.010	-40.00	-33.00	0.00
207	0.039	-28.16	-21.16	0.01	252	0.010	-40.00	-33.00	0.00
208	0.039	-28.20	-21.20	0.01	253	0.010	-40.00	-33.00	0.00
209	0.039	-28.25	-21.25	0.01	254	0.010	-40.00	-33.00	0.00
210	0.038	-28.29	-21.29	0.01	255	0.010	-40.00	-33.00	0.00
211	0.038	-28.40	-21.40	0.01	256	0.010	-40.00	-33.00	0.00
212	0.038	-28.52	-21.52	0.01	257	0.010	-40.00	-33.00	0.00
213	0.037	-28.64	-21.64	0.01	258	0.010	-40.00	-33.00	0.00
214	0.036	-28.75	-21.75	0.01	259	0.010	-40.00	-33.00	0.00
215	0.036	-28.87	-21.87	0.01	260	0.010	-40.00	-33.00	0.00
216	0.036	-29.00	-22.00	0.01	261	0.010	-40.00	-33.00	0.00
217	0.035	-29.12	-22.12	0.01	262	0.010	-40.00	-33.00	0.00
218	0.034	-29.24	-22.24	0.01	263	0.010	-40.00	-33.00	0.00
219	0.034	-29.37	-22.37	0.01	264	0.010	-40.00	-33.00	0.00
220	0.034	-29.50	-22.50	0.01	265	0.010	-40.00	-33.00	0.00
221	0.033	-29.74	-22.74	0.01	266	0.010	-40.00	-33.00	0.00
222	0.032	-29.98	-22.98	0.01	267	0.010	-40.00	-33.00	0.00
223	0.031	-30.23	-23.23	0.00	268	0.010	-40.00	-33.00	0.00
224	0.030	-30.49	-23.49	0.00	269	0.010	-40.00	-33.00	0.00

Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Elements rotated to 120.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Horizontal polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
270	0.010	-40.00	-33.00	0.00	315	0.360	-8.87	-1.87	0.65
271	0.010	-40.00	-33.00	0.00	316	0.382	-8.36	-1.36	0.73
272	0.010	-40.00	-33.00	0.00	317	0.404	-7.87	-0.87	0.82
273	0.010	-40.00	-33.00	0.00	318	0.426	-7.41	-0.41	0.91
274	0.010	-40.00	-33.00	0.00	319	0.448	-6.97	0.03	1.01
275	0.010	-40.00	-33.00	0.00	320	0.470	-6.56	0.44	1.11
276	0.010	-40.00	-33.00	0.00	321	0.488	-6.22	0.78	1.20
277	0.010	-40.00	-33.00	0.00	322	0.507	-5.90	1.10	1.29
278	0.010	-40.00	-33.00	0.00	323	0.525	-5.59	1.41	1.38
279	0.010	-40.00	-33.00	0.00	324	0.544	-5.29	1.71	1.48
280	0.010	-40.00	-33.00	0.00	325	0.562	-5.00	2.00	1.59
281	0.010	-40.00	-33.00	0.00	326	0.579	-4.75	2.25	1.68
282	0.010	-40.00	-33.00	0.00	327	0.595	-4.50	2.50	1.78
283	0.010	-40.00	-33.00	0.00	328	0.612	-4.26	2.74	1.88
284	0.010	-40.00	-33.00	0.00	329	0.628	-4.03	2.97	1.98
285	0.010	-40.00	-33.00	0.00	330	0.645	-3.81	3.19	2.09
286	0.012	-38.42	-31.42	0.00	331	0.663	-3.57	3.43	2.20
287	0.014	-37.08	-30.08	0.00	332	0.681	-3.34	3.66	2.32
288	0.016	-35.92	-28.92	0.00	333	0.699	-3.11	3.89	2.45
289	0.018	-34.89	-27.89	0.00	334	0.717	-2.89	4.11	2.58
290	0.020	-33.98	-26.98	0.00	335	0.735	-2.67	4.33	2.71
291	0.025	-32.04	-25.04	0.00	336	0.752	-2.48	4.52	2.83
292	0.030	-30.46	-23.46	0.00	337	0.769	-2.28	4.72	2.96
293	0.035	-29.12	-22.12	0.01	338	0.786	-2.09	4.91	3.10
294	0.040	-27.96	-20.96	0.01	339	0.803	-1.91	5.09	3.23
295	0.045	-26.94	-19.94	0.01	340	0.820	-1.72	5.28	3.37
296	0.053	-25.51	-18.51	0.01	341	0.835	-1.57	5.43	3.49
297	0.061	-24.29	-17.29	0.02	342	0.850	-1.41	5.59	3.62
298	0.069	-23.22	-16.22	0.02	343	0.865	-1.26	5.74	3.75
299	0.077	-22.27	-15.27	0.03	344	0.880	-1.11	5.89	3.88
300	0.085	-21.41	-14.41	0.04	345	0.895	-0.96	6.04	4.01
301	0.099	-20.09	-13.09	0.05	346	0.906	-0.86	6.14	4.11
302	0.113	-18.94	-11.94	0.06	347	0.917	-0.75	6.25	4.21
303	0.127	-17.92	-10.92	0.08	348	0.928	-0.65	6.35	4.32
304	0.141	-17.02	-10.02	0.10	349	0.939	-0.55	6.45	4.42
305	0.155	-16.19	-9.19	0.12	350	0.950	-0.45	6.55	4.52
306	0.174	-15.19	-8.19	0.15	351	0.956	-0.39	6.61	4.58
307	0.193	-14.29	-7.29	0.19	352	0.962	-0.34	6.66	4.64
308	0.212	-13.47	-6.47	0.23	353	0.968	-0.28	6.72	4.70
309	0.231	-12.73	-5.73	0.27	354	0.974	-0.23	6.77	4.75
310	0.250	-12.04	-5.04	0.31	355	0.980	-0.18	6.82	4.81
311	0.272	-11.31	-4.31	0.37	356	0.984	-0.14	6.86	4.85
312	0.294	-10.63	-3.63	0.43	357	0.988	-0.10	6.90	4.89
313	0.316	-10.01	-3.01	0.50	358	0.992	-0.07	6.93	4.93
314	0.338	-9.42	-2.42	0.57	359	0.996	-0.03	6.97	4.97

Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Elements rotated to 120.0°T) (public record copy)

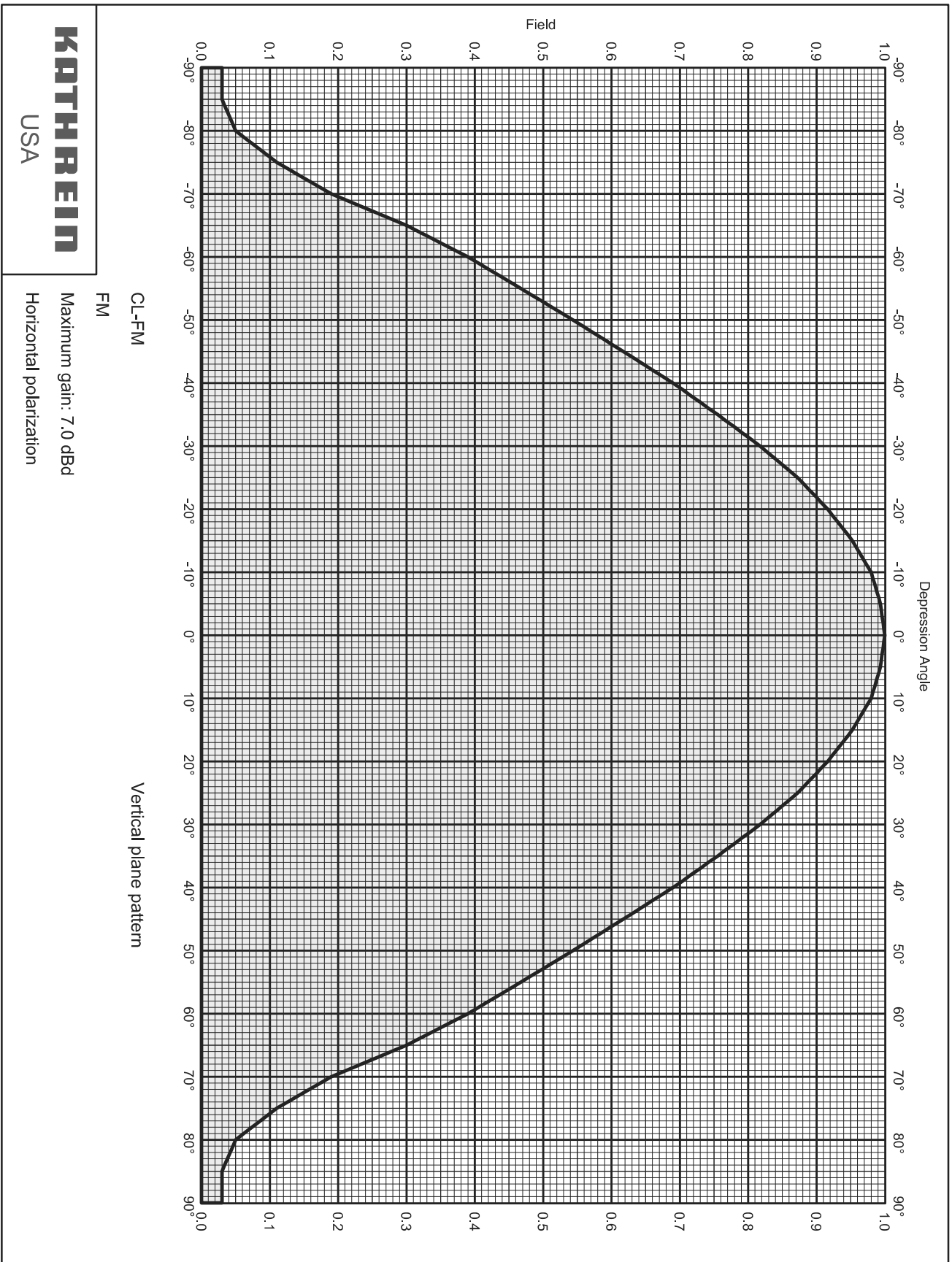


Exhibit 9

Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Elements rotated to 120.0°T) (public record copy)

CL-FM
FM
Maximum gain: 7 dBd
Horizontal polarization
Vertical plane pattern

CL-FM
FM Log-Periodic Antenna
88–108 MHz

KATHREIN

Angle	Rel.Field	Rel.dB	dBd	PwrMult	Angle	Rel.Field	Rel.dB	dBd	PwrMult
-90	0.030	-30.46	-23.46	0.00	1	0.998	-0.01	6.99	5.00
-89	0.030	-30.46	-23.46	0.00	2	0.997	-0.02	6.98	4.99
-88	0.030	-30.46	-23.46	0.00	3	0.996	-0.03	6.97	4.98
-87	0.030	-30.46	-23.46	0.00	4	0.995	-0.04	6.96	4.97
-86	0.030	-30.46	-23.46	0.00	5	0.993	-0.06	6.94	4.94
-85	0.030	-30.46	-23.46	0.00	6	0.991	-0.08	6.92	4.92
-84	0.034	-29.37	-22.37	0.01	7	0.988	-0.10	6.90	4.90
-83	0.038	-28.40	-21.40	0.01	8	0.985	-0.13	6.87	4.86
-82	0.042	-27.54	-20.54	0.01	9	0.982	-0.15	6.85	4.84
-81	0.046	-26.74	-19.74	0.01	10	0.980	-0.18	6.82	4.81
-80	0.050	-26.02	-19.02	0.01	11	0.975	-0.22	6.78	4.76
-79	0.062	-24.15	-17.15	0.02	12	0.969	-0.27	6.73	4.71
-78	0.074	-22.62	-15.62	0.03	13	0.964	-0.32	6.68	4.66
-77	0.086	-21.31	-14.31	0.04	14	0.958	-0.37	6.63	4.60
-76	0.098	-20.18	-13.18	0.05	15	0.952	-0.42	6.58	4.55
-75	0.110	-19.17	-12.17	0.06	16	0.946	-0.49	6.51	4.48
-74	0.126	-17.99	-10.99	0.08	17	0.938	-0.56	6.44	4.41
-73	0.142	-16.95	-9.95	0.10	18	0.931	-0.62	6.38	4.35
-72	0.158	-16.03	-9.03	0.13	19	0.923	-0.69	6.31	4.28
-71	0.174	-15.19	-8.19	0.15	20	0.916	-0.76	6.24	4.21
-70	0.190	-14.42	-7.42	0.18	21	0.908	-0.84	6.16	4.13
-69	0.212	-13.47	-6.47	0.23	22	0.899	-0.92	6.08	4.06
-68	0.234	-12.62	-5.62	0.27	23	0.890	-1.01	5.99	3.97
-67	0.256	-11.84	-4.84	0.33	24	0.882	-1.10	5.90	3.89
-66	0.278	-11.12	-4.12	0.39	25	0.873	-1.18	5.82	3.82
-65	0.300	-10.46	-3.46	0.45	26	0.862	-1.29	5.71	3.72
-64	0.318	-9.95	-2.95	0.51	27	0.851	-1.41	5.59	3.62
-63	0.336	-9.47	-2.47	0.57	28	0.840	-1.52	5.48	3.53
-62	0.354	-9.02	-2.02	0.63	29	0.829	-1.63	5.37	3.44
-61	0.372	-8.59	-1.59	0.69	30	0.817	-1.75	5.25	3.35
-60	0.390	-8.18	-1.18	0.76	31	0.806	-1.88	5.12	3.25
-59	0.405	-7.84	-0.84	0.82	32	0.793	-2.02	4.98	3.15
-58	0.421	-7.51	-0.51	0.89	33	0.781	-2.15	4.85	3.05
-57	0.436	-7.20	-0.20	0.95	34	0.767	-2.30	4.70	2.95
-56	0.452	-6.90	0.10	1.02	35	0.756	-2.44	4.56	2.86
-55	0.467	-6.60	0.40	1.10	36	0.742	-2.59	4.41	2.76
-54	0.483	-6.33	0.67	1.17	37	0.729	-2.74	4.26	2.67
-53	0.498	-6.06	0.94	1.24	38	0.716	-2.90	4.10	2.57
-52	0.513	-5.80	1.20	1.32	39	0.704	-3.05	3.95	2.48
-51	0.528	-5.54	1.46	1.40	40	0.690	-3.22	3.78	2.39
-50	0.544	-5.30	1.70	1.48	41	0.675	-3.41	3.59	2.29
-49	0.558	-5.06	1.94	1.56	42	0.661	-3.60	3.40	2.19
-48	0.573	-4.84	2.16	1.64	43	0.646	-3.79	3.21	2.09
-47	0.588	-4.61	2.39	1.73	44	0.632	-3.99	3.01	2.00
-46	0.602	-4.40	2.60	1.82	45	0.618	-4.19	2.81	1.91
-45	0.618	-4.19	2.81	1.91	46	0.602	-4.40	2.60	1.82
-44	0.632	-3.99	3.01	2.00	47	0.588	-4.61	2.39	1.73
-43	0.646	-3.79	3.21	2.09	48	0.573	-4.84	2.16	1.64
-42	0.661	-3.60	3.40	2.19	49	0.558	-5.06	1.94	1.56
-41	0.675	-3.41	3.59	2.29	50	0.544	-5.30	1.70	1.48
-40	0.690	-3.22	3.78	2.39	51	0.528	-5.54	1.46	1.40
-39	0.704	-3.05	3.95	2.48	52	0.513	-5.80	1.20	1.32
-38	0.716	-2.90	4.10	2.57	53	0.498	-6.06	0.94	1.24
-37	0.729	-2.74	4.26	2.67	54	0.483	-6.33	0.67	1.17
-36	0.742	-2.59	4.41	2.76	55	0.467	-6.60	0.40	1.10
-35	0.756	-2.44	4.56	2.86	56	0.452	-6.90	0.10	1.02
-34	0.767	-2.30	4.70	2.95	57	0.436	-7.20	-0.20	0.95
-33	0.781	-2.15	4.85	3.05	58	0.421	-7.51	-0.51	0.89
-32	0.793	-2.02	4.98	3.15	59	0.405	-7.84	-0.84	0.82
-31	0.806	-1.88	5.12	3.25	60	0.390	-8.18	-1.18	0.76
-30	0.817	-1.75	5.25	3.35	61	0.372	-8.59	-1.59	0.69
-29	0.829	-1.63	5.37	3.44	62	0.354	-9.02	-2.02	0.63
-28	0.840	-1.52	5.48	3.53	63	0.336	-9.47	-2.47	0.57
-27	0.851	-1.41	5.59	3.62	64	0.318	-9.95	-2.95	0.51
-26	0.862	-1.29	5.71	3.72	65	0.300	-10.46	-3.46	0.45
-25	0.873	-1.18	5.82	3.82	66	0.278	-11.12	-4.12	0.39
-24	0.882	-1.10	5.90	3.89	67	0.256	-11.84	-4.84	0.33
-23	0.890	-1.01	5.99	3.97	68	0.234	-12.62	-5.62	0.27
-22	0.899	-0.92	6.08	4.06	69	0.212	-13.47	-6.47	0.23
-21	0.908	-0.84	6.16	4.13	70	0.190	-14.42	-7.42	0.18
-20	0.916	-0.76	6.24	4.21	71	0.174	-15.19	-8.19	0.15
-19	0.923	-0.69	6.31	4.28	72	0.158	-16.03	-9.03	0.13
-18	0.931	-0.62	6.38	4.35	73	0.142	-16.95	-9.95	0.10
-17	0.938	-0.56	6.44	4.41	74	0.126	-17.99	-10.99	0.08
-16	0.946	-0.49	6.51	4.48	75	0.110	-19.17	-12.17	0.06
-15	0.952	-0.42	6.58	4.55	76	0.098	-20.18	-13.18	0.05
-14	0.958	-0.37	6.63	4.60	77	0.086	-21.31	-14.31	0.04
-13	0.964	-0.32	6.68	4.66	78	0.074	-22.62	-15.62	0.03
-12	0.969	-0.27	6.73	4.71	79	0.062	-24.15	-17.15	0.02
-11	0.975	-0.22	6.78	4.76	80	0.050	-26.02	-19.02	0.01
-10	0.980	-0.18	6.82	4.81	81	0.046	-26.74	-19.74	0.01
-9	0.982	-0.15	6.85	4.84	82	0.042	-27.54	-20.54	0.01
-8	0.985	-0.13	6.87	4.86	83	0.038	-28.40	-21.40	0.01
-7	0.988	-0.10	6.90	4.90	84	0.034	-29.37	-22.37	0.01
-6	0.991	-0.08	6.92	4.92	85	0.030	-30.46	-23.46	0.00
-5	0.993	-0.06	6.94	4.94	86	0.030	-30.46	-23.46	0.00
-4	0.995	-0.04	6.96	4.97	87	0.030	-30.46	-23.46	0.00
-3	0.996	-0.03	6.97	4.98	88	0.030	-30.46	-23.46	0.00
-2	0.997	-0.02	6.98	4.99	89	0.030	-30.46	-23.46	0.00
-1	0.998	-0.01	6.99	5.00	90	0.030	-30.46	-23.46	0.00
0	1.000	0.00	7.00	5.01					