

# Technical Report Supporting a Minor Change in Licensed Facility Construction Permit Application

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

*for*

*W202AW - Sandusky, OH  
(Facility ID: 77850)*

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*Non-Adjacent Channel Change per  
47 C.F.R. Section 74.1233(a)(1)*

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*as a*

*Non-Commercial,  
Regular (non-fill-in) Translator  
for WYFQ-FM - Wadesboro, NC*

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December , 2023

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RF Appendix 1 - Radio Frequency Radiation Compliance Showing

**EXPLANATION OF PROPOSAL:** This LMS filing and accompanying technical report supports a Minor Change in Licensed Facility Construction Permit Application for FM Translator W202AW - Sandusky, OH (Facility ID: 77850). This filing requests a 47 C.F.R. Section 74.1233(a)(1) non-adjacent channel change from CH202D (88.3 MHz) to CH216D (91.1 MHz) based upon a showing of reduced interference. Operation on the new frequency of CH216D (91.1 MHz) with a directional power of 0.200 kW ERP circular polarization (H&V) is requested. The FM Translator will operate from the same COR of 215.0 meters AMSL at the same site location. This LMS Filing will specify rebroadcast of Class C3 FM Primary Station WYFQ-FM - Wadesboro, NC (CH228C3, 93.5 MHz); Facility ID No. 73965. The Translator will continue to provide service to the community of Sandusky, OH.

**FACILITY COMPLIANCE SHOWINGS:** A map of the proposed 60 dB $\mu$  service contour in relation to the present 60 dB $\mu$  service contour has been included in **Exhibit 1**. The minor change proposed service area will overlap a portion of the presently licensed service area as noted in the exhibit. The proposed 60 dB $\mu$  contour of the Translator lies wholly outside of the NCE-FM Primary Station 60 dB $\mu$  contour. The Primary Station service contour relationship has been plotted in **Exhibit 2**. The Translator will be fed via a satellite link.

The proposed facility will be located on the tower bearing Antenna Structure Registration Number 1060431. 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**.

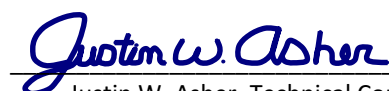
**ALLOCATION COMPLIANCE SHOWINGS:** The proposed Translator remains in compliance with 47 C.F.R. Section 74.1204 toward all allocation protection concerns. A general allocation study for this proposal is found in **Exhibit 6**. There are four (4) facilities, existing or proposed, close enough to merit 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. A copy of the manufacturer's directional antenna specifications has been included in **Exhibit 8**.

Regarding protection of international concerns, the facility is, and will remain, within 320 km from the common border between the United States and Canada. However, full 47 C.F.R. Section 74.1235(d) protection will be afforded all Canadian concerns as the proposed 34 dBμ F(50:10) contour will not enter Canadian territory (See **Exhibit 2**). As a result, no further international protection showings are believed required; nor is extended international Canadian concurrence believed necessary.

**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, 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 is being replaced on an existing structure, 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 twenty-four 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  
December 29, 2023

**Exhibit 1**  
**Service Contour Study:**  
**Present vs Proposed Operations**

*Proposed 60 dBμ F(50:50) Contour*  
*Present 60 dBμ F(50:50) Contour*

CH216D.P  
Sandusky, OH  
Proposed Operation  
Facility ID: 77850  
Latitude: 41-23-58 N  
Longitude: 082-39-07 W  
ERP: 0.20 kW  
Channel: 216D (91.1 MHz)  
AMSL Height: 215.0 m  
Horiz. Pattern: Directional

60 dBμ F(50:50) Contour  
Total Population: 30,165  
Total Area: 143.3 sq. km

W202AW.L  
Sandusky, OH  
0000198691  
Facility ID: 77850  
Latitude: 41-23-58.20 N  
Longitude: 082-39-06.60 W  
ERP: 0.12 kW  
Channel: 202D (88.3 MHz)  
AMSL Height: 215.0 m  
Horiz. Pattern: Omni

60 dBμ F(50:50) Contour  
Total Population: 23,805  
Total Area: 124.6 sq. km

NED 03 SEC Terrain Database  
US Census 2020 PL Database  
NED 1983 Coordinate Datum

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

Terrain  
165 259 m

Scale 1:85,000  
0 2 4 6 km

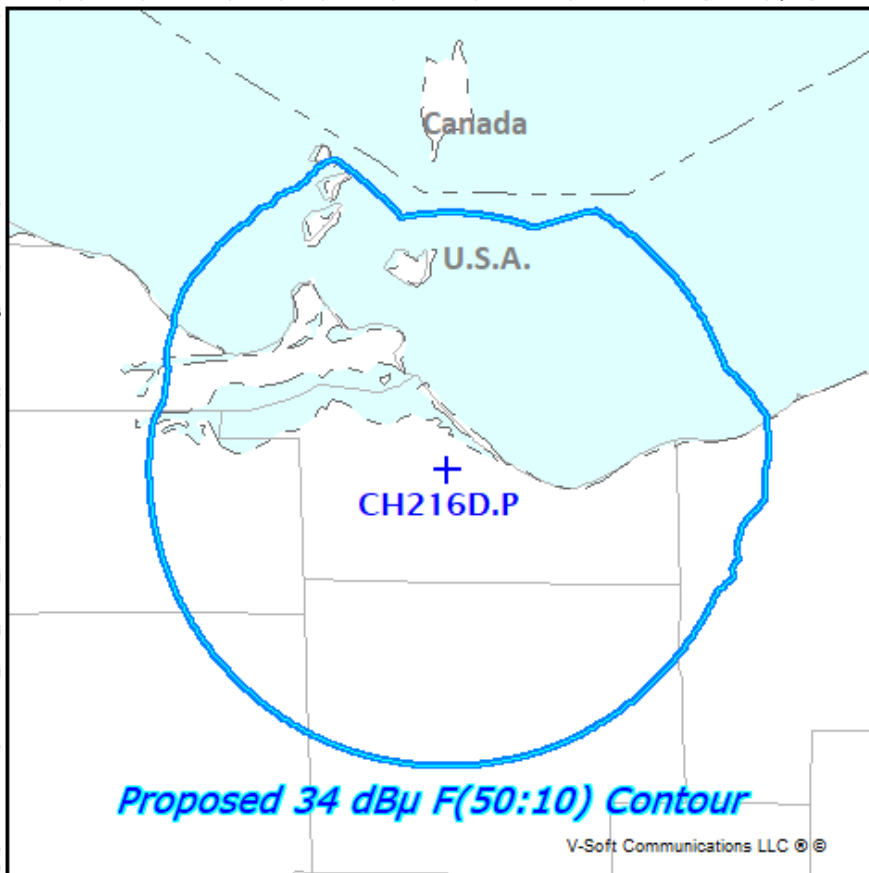
V-Soft Communications LLC ©

**Exhibit 2**  
**Service Contour Study:**  
**Proposed vs Primary Operations**

**CH216D.P**  
*Proposed 60 dBμ F(50:50) Contour*  
*Proposed 34 dBμ F(50:10) Contour*

**CH216D.P**  
Sandusky, OH  
Proposed Operation  
Facility ID: 77850  
Latitude: 41-23-58 N  
Longitude: 082-39-07 W  
ERP: 0.20 kW  
Channel: 216D (91.1 MHz)  
AMSL Height: 215.0 m  
Pattern: Directional

**WYFQ-FM.L**  
Wadesboro, NC  
BLED19951010KE  
Facility ID: 73965  
Latitude: 35-02-57.50 N  
Longitude: 080-18-37.20 W  
ERP: 8.70 kW  
Channel: 228C3 (93.5 MHz)  
AMSL Height: 310.0 m  
Pattern: Omni



**Primary 60 dBμ F(50:50) Contour**

NED 03 SEC Terrain Database  
US Census 2020 PL Database  
NED 1983 Coordinate Datum

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justinasher@consultant.com  
1 (202) 875-2986

**WYFQ-FM.L**

Scale 1:3,500,000  
0 40 80 120 km

V-Soft Communications LLC ©

**Exhibit 3**  
**Copy of Existing Antenna Structure Registration**  
**(public record copy)**

**Registration Detail**

Reg Number	1060431	Status	Constructed
File Number	A1220701	Constructed	05/06/1999
EMI	No	Dismantled	
NEPA	No		

**Antenna Structure**

Structure Type

**Location** (in NAD83 Coordinates)

Lat/Long	41-23-58.0 N 082-39-07.0 W	Address	INT OF US 250 & SR 2
City, State	SANDUSKY , OH		
Zip	44870	County	ERIE
Center of AM Array		Position of Tower in Array	

**Heights (meters)**

Elevation of Site Above Mean Sea Level	Overall Height Above Ground (AGL)
185.0	83.5
Overall Height Above Mean Sea Level	Overall Height Above Ground w/o Appurtenances
268.5	81.0

**Painting and Lighting Specifications**

FAA Chapters 4, 8, 13  
Paint and Light in Accordance with FAA Circular Number 70/7460-1J

**FAA Notification**

FAA Study	97-AGL-5722-OE	FAA Issue Date	05/29/1998
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**Owner & Contact Information**

FRN	0002916179	Owner Entity Type	Government Entity
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**Owner**

PERKINS, TOWNSHIP OF Attention To: Ms Ashley Ohlemacher 2610 Columbus Ave SANDUSKY , OH 44870	P: (419)609-1419 F: E: ashleyo@perkinstownship.com
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**Contact**

Reichelt , David 5900 SOM Center Rd Suite 12 - PMB#167 Willoughby , OH 44094	P: (216)263-8716 F: E: reichelt@commtower.com
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**Last Action Status**

Status	Constructed	Received	08/10/2022
Purpose	Admin Update	Entered	08/10/2022
Mode	Interactive		

**Related Applications**

08/10/2022	A1220702 - Modification (MD)
08/10/2022	A1220701 - Admin Update (AU)
01/29/1999	A0070869 - New (NE)

**Comments**

**Comments**

None

**History**

<b>Date</b>	<b>Event</b>
08/10/2022	Administrative Update Received

**Pleadings**

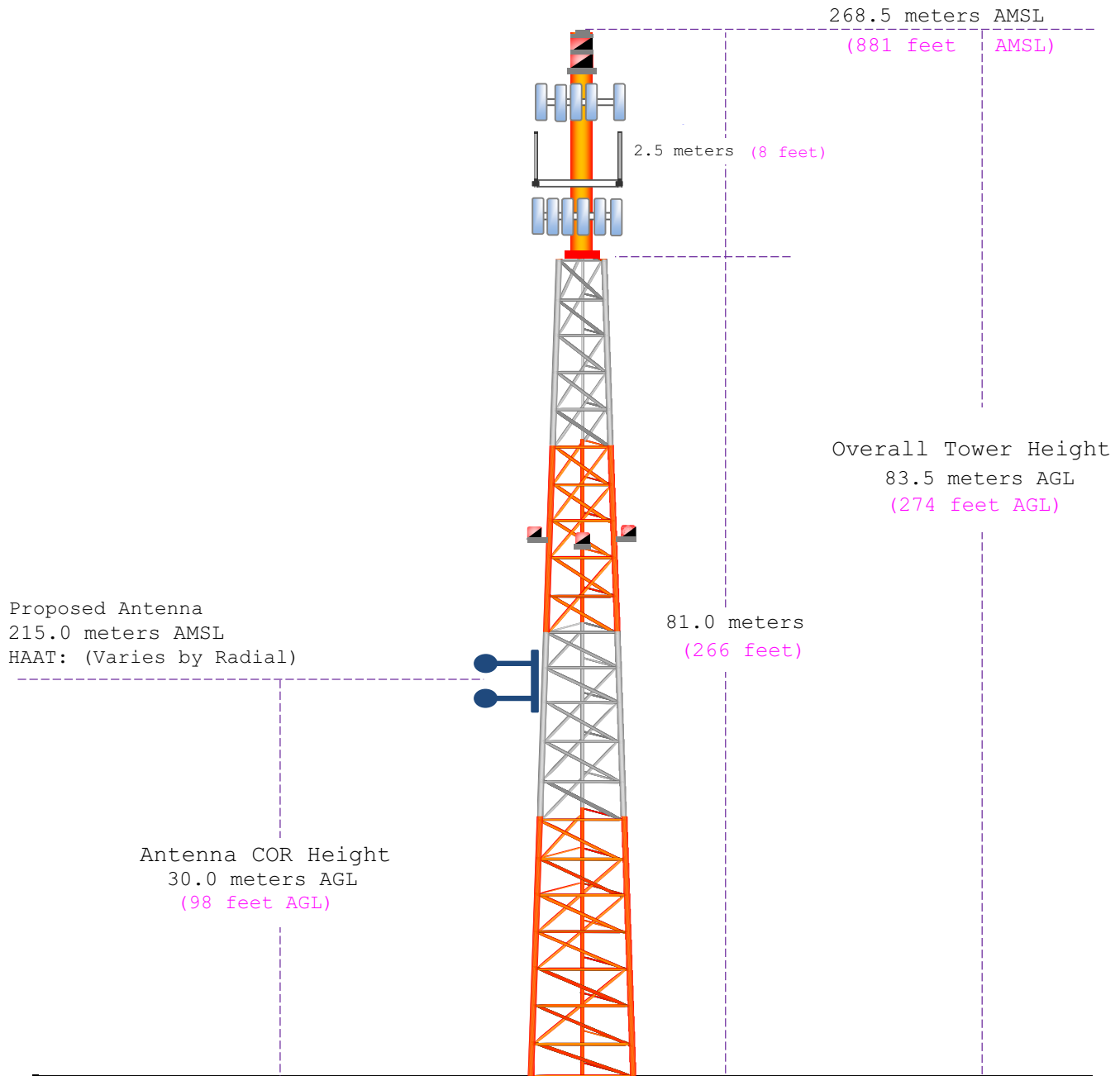
<b>Pleading Type</b>	<b>Filer Name</b>	<b>Description</b>	<b>Date Entered</b>
None			

**Automated Letters**

None

# Exhibit 4

## Vertical Plan of Antenna System



Ground Elevation: 185.0 meters AMSL (607 feet AMSL)		
Address: Intersection of US Highway 250 and State Route 2.		
City: Sandusky	Latitude (D M S) Longitude (D M S)	
County: Erie	--- (NAD 1927)	
State: Ohio	Lat/Long 41-23-58.0 N 082-39-07.0 W (NAD 1983)	
Antenna Structure Registration 1060431	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 (NAD 1983):**

N. Lat. = 412358.0    W. Lng. = 823907.0  
 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	174.1	40.9	0.0720	-11.43	0.600	6.01
030	174.1	40.9	0.1201	-9.20	0.775	6.83
060	174.4	40.6	0.1201	-9.20	0.775	6.80
090	177.4	37.6	0.1700	-7.70	0.922	7.14
120	188.4	26.6	0.2000	-6.99	1.000	6.71
150	194.4	20.6	0.2000	-6.99	1.000	6.71
180	205.1	9.9	0.2000	-6.99	1.000	6.71
210	215.6	-0.6	0.2000	-6.99	1.000	6.71
240	208.4	6.6	0.2000	-6.99	1.000	6.71
270	194.9	20.1	0.2000	-6.99	1.000	6.71
300	178.6	36.4	0.1700	-7.70	0.922	7.03
330	177.0	38.0	0.1700	-7.70	0.922	7.18

Ave El= 188.53 M    HAAT= 26.47 M    AMSL= 215.0

#### **NAD 1983 to NAD 1927 Conversion:**

#### **Various Coordinate Conversion Calculations (NAD 1983):**

<b>Position Type</b>	Lat Lon
<b>Degrees Lat Long</b>	41.3994444°, -082.6519444°
<b>Degrees Minutes</b>	41°23.96667', -082°39.11667'
<b>Degrees Minutes Seconds</b>	41°23'58.0000", -082°39'07.0000"
<b>UTM</b>	17T 361908mE 4584417mN
<b>UTM centimeter</b>	17T 361908.64mE 4584417.39mN
<b>MGRS</b>	17TLF6190884417
<b>Grid North</b>	-1.1°
<b>GARS</b>	195LY25
<b>Maidenhead</b>	EN81QJ15SU47
<b>GEOREF</b>	GJHM20882396

# ***Exhibit 6***

## ***Tabulation of Proposed Allocation***

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

Bible Broadcasting Network, I																	
REFERENCE		CH#	216D	-	91.1	MHz,	Pwr=	0.2	kW	DA,	HAAT=	29.0	M,	COR=	215	M	DISPLAY DATES
41 23 58.00 N.		Average Protected F(50-50)= 6.71 km															DATA 12-28-23
82 39 07.00 W.		Standard Directional															SEARCH 12-28-23
CH	CALL	TYPE	ANT	AZI	DIST	LAT	PWR(kW)	INT(km)	PRO(km)	*IN*	*OUT*						
CITY	STATE			<--	FILE #	LNG	HAAT(M)	COR(M)	LICENSEE	(Overlap	in km)						
216B1	WRUW-FM	LIC DCN		81.0	89.99	41 31 14.20	15.000	107.6	39.6	-24.8*	25.9						
Cleveland	OH			261.7	BLD20010406AAQ	81 35 02.40	89	320	Case Western Reserve Unive								
217B	WGTE-FM	LIC _CN		294.1	70.97	41 39 27.10	13.500	76.8	52.3	-12.9*	8.7						
Toledo	OH			113.6	BLD19890123KE	83 25 54.70	289	470	Public Broadcasting Founda								
216B1	WOSB	LIC _EN		212.7	94.28	40 41 04.20	6.800	87.2	27.8	0.4	43.8						
Marion	OH			32.3	BLD19980410KC	83 15 23.70	87	360	The Ohio State University								
214A	WNRK	LIC DCN		137.8	32.77	41 10 50.20	4.000	2.7	28.9	23.4	2.7						
Norwalk	OH			318.0	BLD20040608ABM	82 23 20.60	124	399	Kent State University								
215A	WSHB	LIC DCN		183.6	39.14	41 02 53.10	0.450	9.9	6.9	22.6	21.6						
Willard	OH			3.6	BLD20131126BNC	82 40 52.20	72	362	Our Lady Of Guadalupe Radi								
218A	WOBC-FM	LIC _CN		108.0	37.74	41 17 38.10	1.000	1.6	10.5	29.2	25.9						
Oberlin	OH			288.3	BLD20041014ADB	82 13 19.50	41	278	Oberlin College Broadcasti								
218D	W218BL	LIC _HN		186.7	40.75	41 02 07.20	0.055	0.5	6.9	33.5	32.9						
Willard	OH			6.7	BLFT20000404ACL	82 42 31.60	25	315	Bible Broadcasting Network								
216D	W216AH	LIC _CN		152.6	68.23	40 51 14.20	0.250	23.8	7.1	37.8	38.7						
Ashland	OH			332.8	BLFT20031020ABX	82 16 42.60	-1	342	Soaring Eagle Promotions,								
215A	766396	CP DCN		247.3	62.38	41 10 50.00	2.500	17.1	11.3	38.8	39.7						
Fostoria	OH			66.8	0000167686	83 20 22.60	30	258	Holy Family Communications								
215B	WRCJ-FM	LIC DCN		339.9	124.29	42 26 53.10	22.500	77.0	52.2	39.9	61.6						
Detroit	MI			159.5	BLD20150630AAS	83 10 22.70	216	416	Detroit Classical And Jazz								
216A	WOSE	LIC DCN		153.6	130.99	40 20 30.20	6.000	76.3	23.6	48.1	84.4						
Coshocton	OH			334.1	BLD19960311KH	81 57 55.40	98	388	The Ohio State University								
214D	NEW	LIC _VN		9.2	63.50	41 57 50.10	0.050	1.6	6.7	55.6	54.1						
Pt Pelee National	P ON			189.3		82 31 44.60	29	204									
215A	WKWO	LIC _CN		128.2	95.19	40 51 59.30	2.200	31.8	21.4	56.7	63.6						
Wooster	OH			308.8	0000144223	81 45 43.80	79	406	Educational Media Foundati								
217A	WAPS	LIC DEN		112.2	96.82	41 03 53.20	2.000	32.0	20.9	58.6	64.4						
Akron	OH			293.0	BLD20080702ADM	81 34 58.40	106	424	Board Of Education, Akron								
06---	WDMY-LD«	LI _CN		289.1	119.95	41 44 40.99	1.500	0.1	196.1	0.0R	120.0M						
Toledo	OH			108.2	0000163484	84 01 06.00		300									

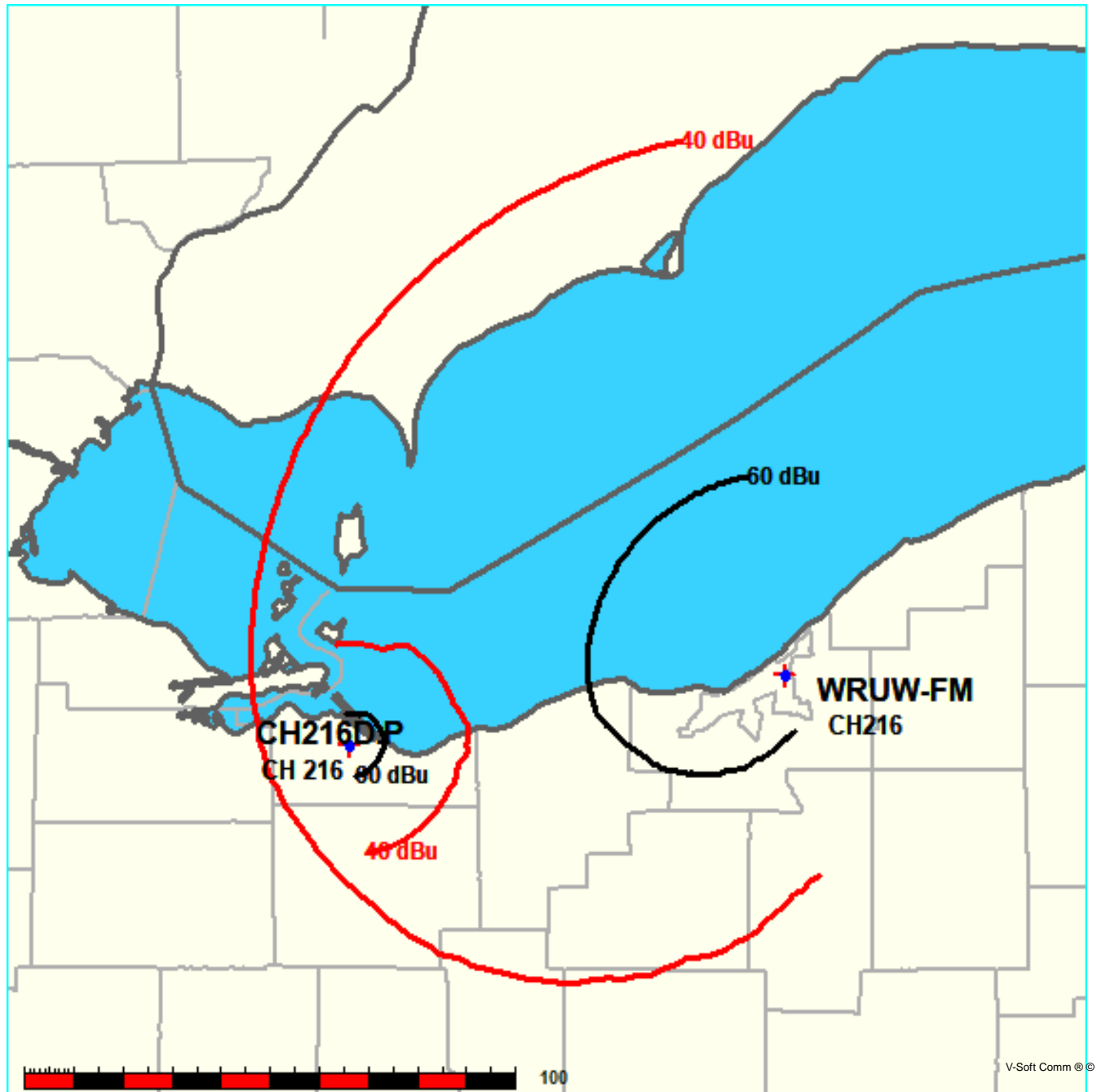
Terrain database is NED 03 SEC , R= 73.215 qualifying spacings or FCC minimum Spacings in KM, M= Margin in KM  
 In & Out distances between contours are shown at closest points. Reference zone= East Zone, Co to 3rd adjacent.  
 All separation margins (if shown) include rounding.  
 Ant Column: (D= DA 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.

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

FMCommander Single Allocation Study - 12-28-2023 - NED 03 SEC  
CH216D.P's Overlaps (In= -24.84 km, Out= 25.92 km)

CH216D.P CH 216 D DA  
Lat= 41 23 58.00, Lng= 82 39 07.00  
0.2 kW 29 m HAAT, 215 m COR  
Prot.= 60 dBu, Intef.= 40 dBu

WRUW-FM CH 216 B1 DA BLED20010406AAQ  
Lat= 41 31 14.20, Lng= 81 35 02.40  
15.0 kW 89 m HAAT, 320 m COR  
Prot.= 60 dBu, Intef.= 40 dBu

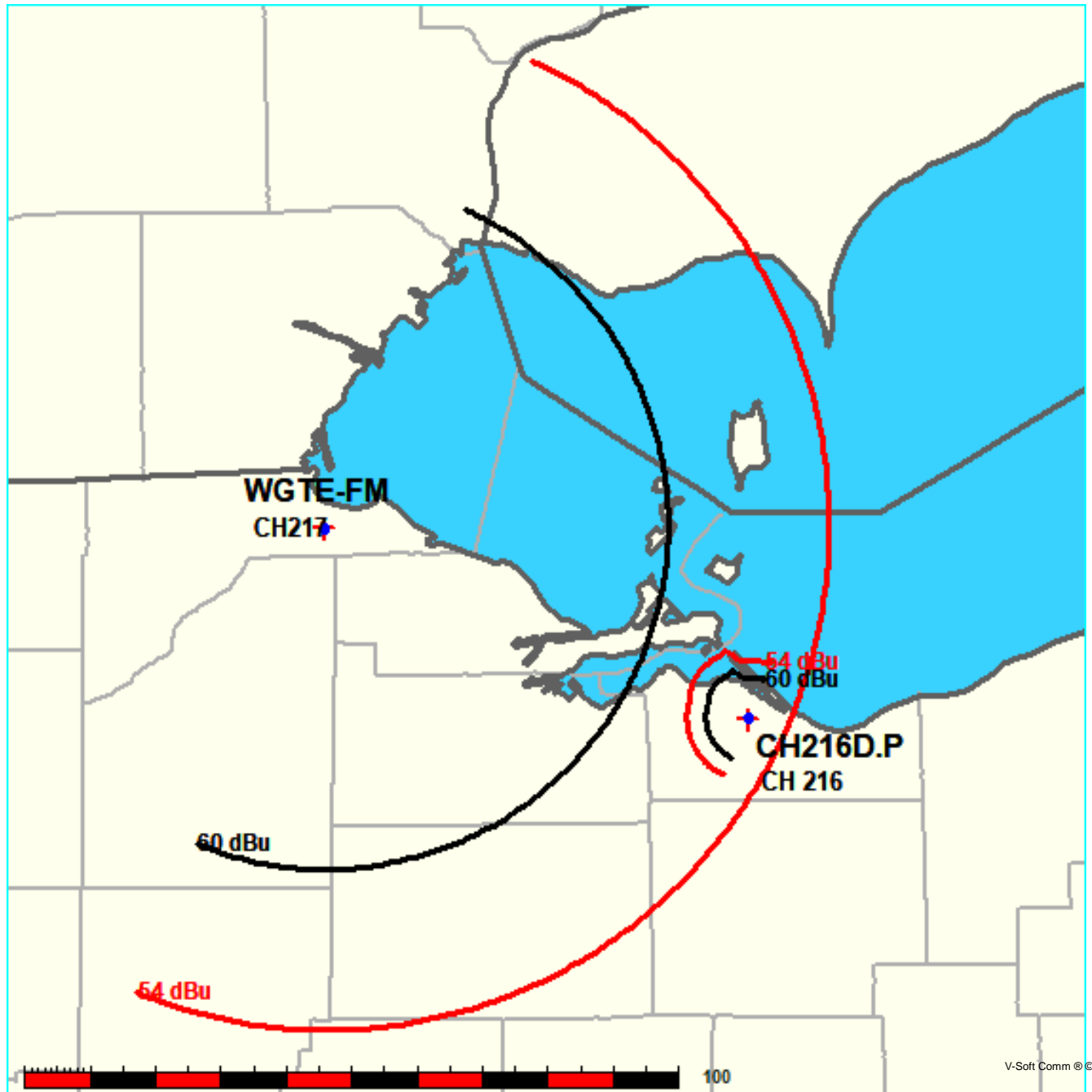


***Exhibit 7b***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

FMCommander Single Allocation Study - 12-28-2023 - NED 03 SEC  
CH216D.P's Overlaps (In= -12.87 km, Out= 8.73 km)

CH216D.P CH 216 D DA  
Lat= 41 23 58.00, Lng= 82 39 07.00  
0.2 kW 29 m HAAT, 215 m COR  
Prot.= 60 dBu, Intef.= 54 dBu

WGTE-FM CH 217 B BLED19890123KE  
Lat= 41 39 27.10, Lng= 83 25 54.70  
13.5 kW 289 m HAAT, 470 m COR  
Prot.= 60 dBu, Intef.= 54 dBu

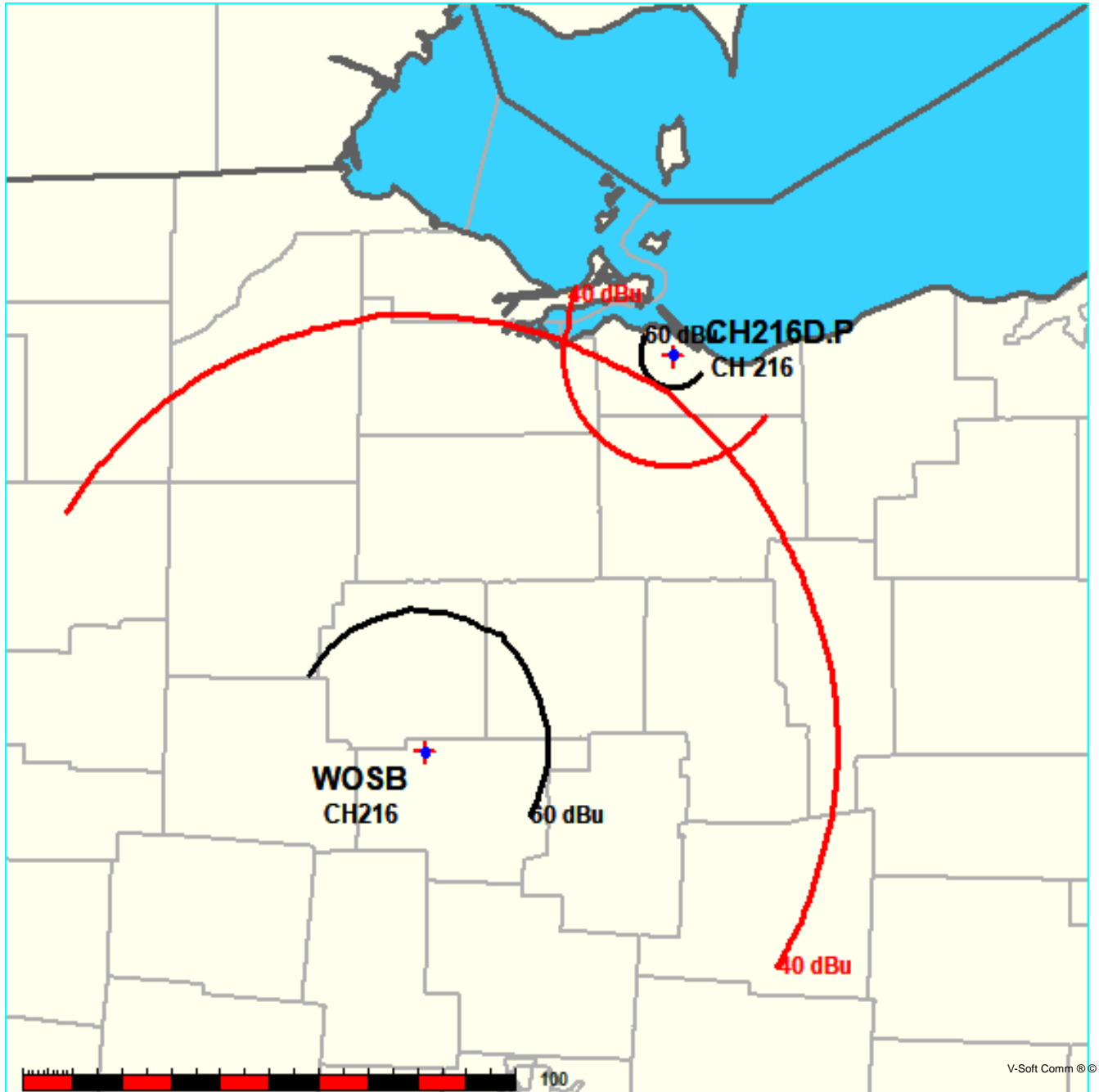


***Exhibit 7c***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

FMCommander Single Allocation Study - 12-28-2023 - NED 03 SEC  
CH216D.P's Overlaps (In= 0.44 km, Out= 43.8 km)

CH216D.P CH 216 D DA  
Lat= 41 23 58.00, Lng= 82 39 07.00  
0.2 kW 29 m HAAT, 215 m COR  
Prot.= 60 dBu, Intef.= 40 dBu

WOSB CH 216 B1 BLED19980410KC  
Lat= 40 41 04.20, Lng= 83 15 23.70  
6.8 kW 87 m HAAT, 360 m COR  
Prot.= 60 dBu, Intef.= 40 dBu

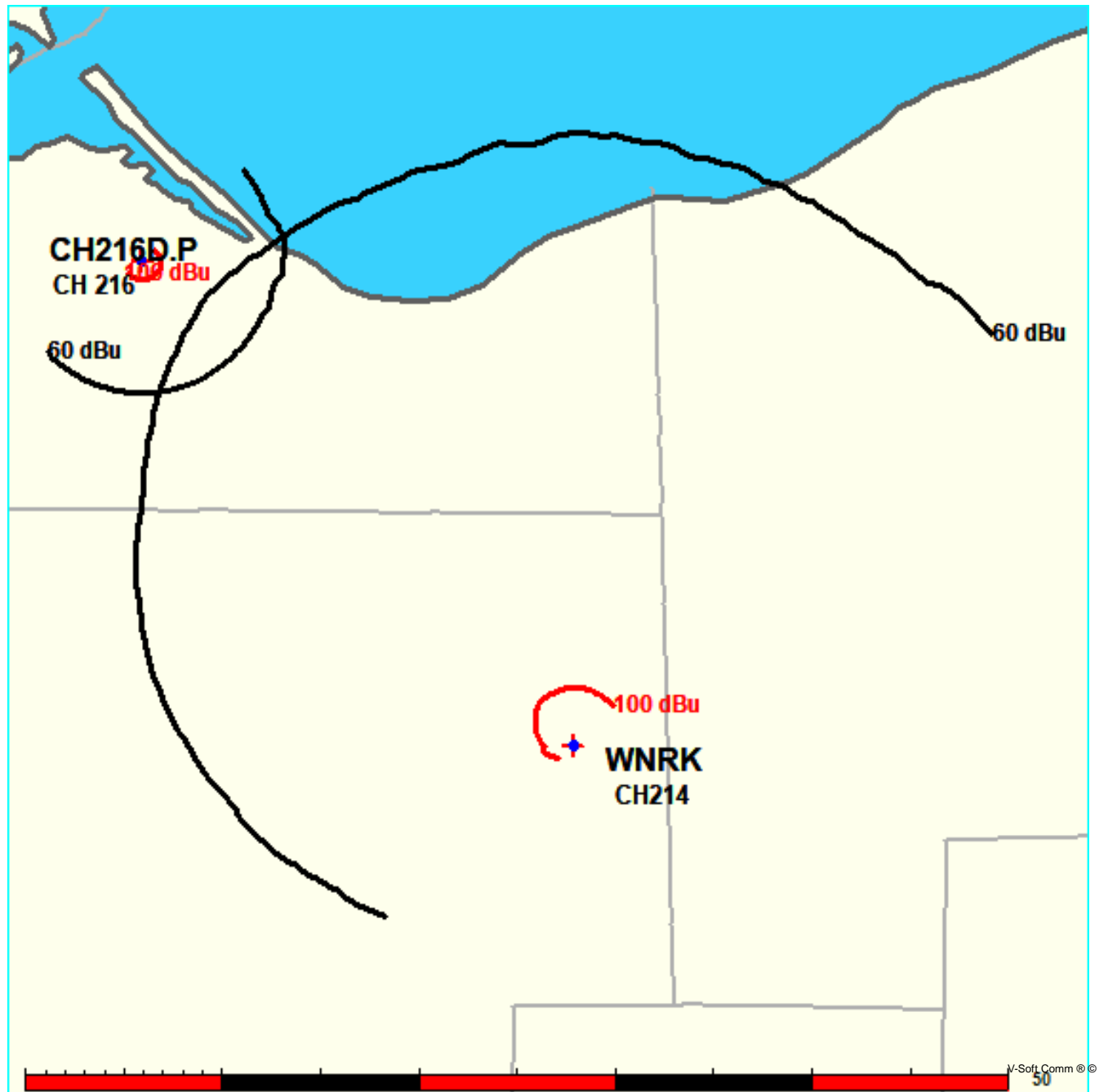


***Exhibit 7d***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

FMCommander Single Allocation Study - 12-28-2023 - NED 03 SEC  
CH216D.P's Overlaps (In= 23.38 km, Out= 2.71 km)

CH216D.P CH 216 D DA  
Lat= 41 23 58.00, Lng= 82 39 07.00  
0.2 kW 29 m HAAT, 215 m COR  
Prot.= 60 dBu, Intef.= 100 dBu

WNRK CH 214 A DA BLED20040608ABM  
Lat= 41 10 50.20, Lng= 82 23 20.60  
4.0 kW 124 m HAAT, 399 m COR  
Prot.= 60 dBu, Intef.= 100 dBu

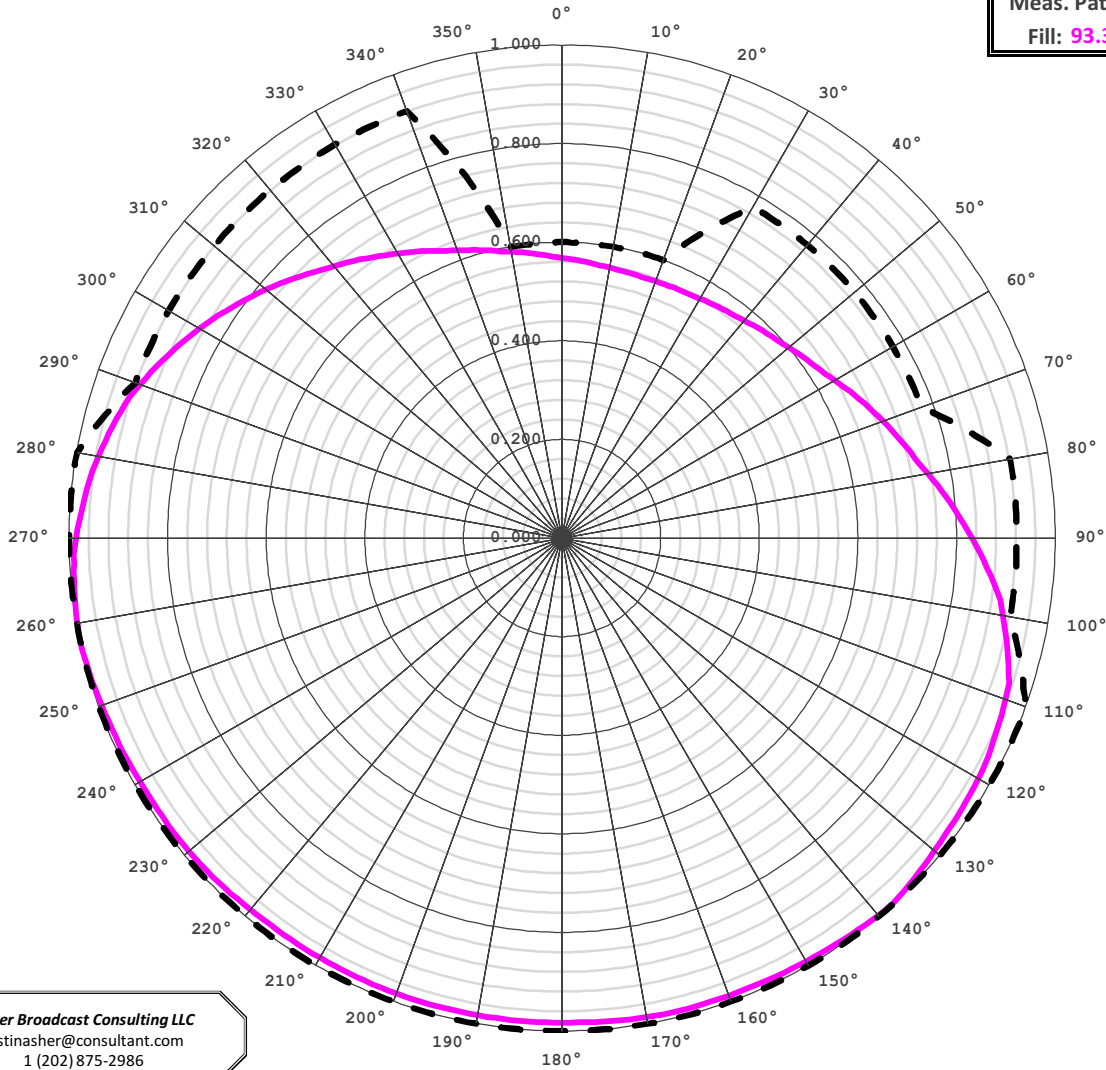


Manufacturer's	Make/Model	Orientation	Power
Element 1:	BKG77-DA	198° True	100.0%
Element 2:			
Element 3:			
Element 4:			

Composite Power: 100%

## Exhibit 8 Manufacturer's Directional Antenna Pattern Data

Meas. Pattern  
Fill: 93.3%



Azimuth ° True	FCC Pattern	Manufacturer's Pattern
0°	0.600	0.568
10°	0.600	0.557
20°	0.600	0.554
30°	0.775	0.561
40°	0.775	0.576
50°	0.775	0.601
60°	0.775	0.639
70°	0.775	0.693
80°	0.922	0.753
90°	0.922	0.831
100°	0.922	0.908
110°	1.000	0.957
120°	1.000	0.975
130°	1.000	0.986
140°	1.000	0.998
150°	1.000	0.991
160°	1.000	0.988
170°	1.000	0.987
180°	1.000	0.983
190°	1.000	0.983
200°	1.000	0.983
210°	1.000	0.983
220°	1.000	0.984
230°	1.000	0.988
240°	1.000	0.989
250°	1.000	0.994
260°	1.000	0.998
270°	1.000	0.985
280°	1.000	0.955
290°	0.922	0.911
300°	0.922	0.849
310°	0.922	0.784
320°	0.922	0.720
330°	0.922	0.666
340°	0.922	0.621
350°	0.600	0.589

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Allocation (FCC) Pattern: ---  
Manufacturer's Pattern: ———

**Exhibit 8**  
**Copy of Manufacturer's Directional Antenna Documentation**  
(Actual Antenna Pattern rotated to **198.0°T**) (public record copy)



Your Number 1 Source For Radio And Digital TV Gear

**BKG 77**

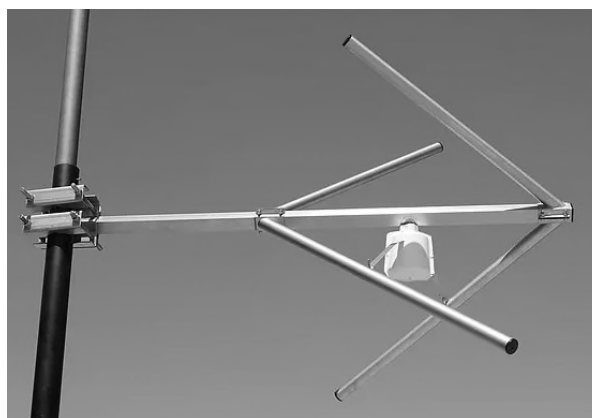
Medium Power Broadband FM Circular Polarization Antenna

**TECHNICAL SPECIFICATIONS**

**Antenna type:** circular  
**polarization:** dipole  
**Front-to-back ratio:** 3 dB  
**Frequency range:** 87.5 - 108 MHz  
**Lightening protection:** all parts grounded  
**Bandwidth:** 20 MHz  
**Max wind velocity:** 120 mph (190 km/h)  
**Impedance:** 50 ohms  
**Wind load:** 53 Lbs (24 kg)  
**Connectors:** N type (1 kw) -7/8 type / 7/16DIN(2 kw)  
**Wind surface:** 1.1 ft<sup>2</sup> (0.10 m<sup>2</sup>)  
**Power rating:** 2000 Watts max  
**Materials (external):** stainless steel  
**VSWR:** < 1.3  
**Mounting:** from 2" to 4"  
**Polarization:** vertical and horizontal  
**Weight:** 25 Lbs (11.3 kg)  
**Gain:** -3 dBd (referred to half-wave dipole)  
**Dimensions:** 58"×32"×32" (1450×800×800mm)  
**H plane:** omnidirectional ±1.5 dB (with a 4" mast)  
**V plane:** omnidirectional ±3 dB (with a 4" mast)  
**Packing:** 68"×10"×10"



**Optional Mini-Radome**





## Exhibit 8

# Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Pattern rotated to 198.0°T) (public record copy)

Date: 29/04/2013

BKG77SINGLE.PRJ

TX station: BKG77-2(0.85WL)

Site name:

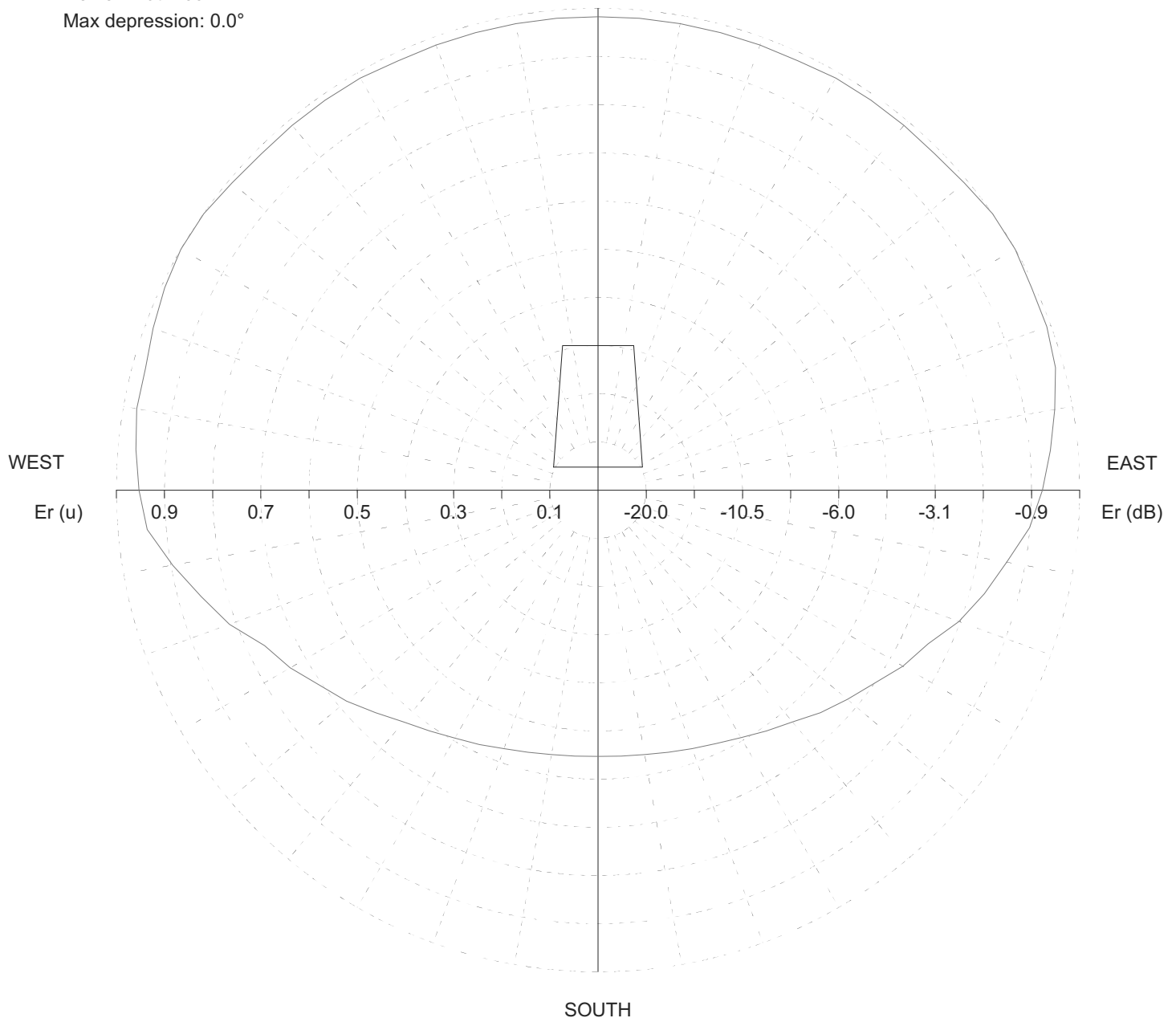
Frequency: 100.00 MHz

### Horizontal diagram of Maxima

NORTH

Max azimuth: 60°

Max depression: 0.0°



—— 0.0° depres. (Total antenna), Gain (dBd): -3.03 ERP T.max (KW): 0.498

ERP E.max (KW): 0.387

NicomUsa, Inc

# Exhibit 8

## Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Pattern rotated to **198.0°T**) (public record copy)

Date: 29/04/2013

BKG77SINGLE.PRJ

TX station: BKG77-2(0.85WL)

Site name:

Frequency: 100.00 MHz

### Horizontal diagram of Maxima

Az (°)	Dep (°)	Er (%)	ERP (W)	Az (°)	Dep (°)	Er (%)	ERP (W)	Az (°)	Dep (°)	Er (%)	ERP (W)
0.0	0.0	98.3	373.6	120.0	0.0	73.1	206.6	240.0	0.0	73.8	210.7
5.0	0.0	98.3	373.6	125.0	0.0	69.9	189.2	245.0	0.0	76.4	225.7
10.0	0.0	98.3	373.6	130.0	0.0	67.6	176.7	250.0	0.0	81.5	256.6
15.0	0.0	98.3	373.6	135.0	0.0	65.3	165.1	255.0	0.0	85.3	281.6
20.0	0.0	98.3	373.6	140.0	0.0	62.8	152.7	260.0	0.0	89.7	311.1
25.0	0.0	98.3	373.6	145.0	0.0	61.0	144.0	265.0	0.0	93.9	341.1
30.0	0.0	98.8	377.5	150.0	0.0	59.4	136.3	270.0	0.0	95.3	351.1
35.0	0.0	98.8	377.5	155.0	0.0	58.0	130.3	275.0	0.0	96.3	358.5
40.0	0.0	98.8	377.5	160.0	0.0	57.1	126.1	280.0	0.0	97.3	366.1
45.0	0.0	98.8	377.5	165.0	0.0	56.3	122.8	285.0	0.0	97.3	366.1
50.0	0.0	99.2	380.8	170.0	0.0	55.8	120.3	290.0	0.0	98.3	373.6
55.0	0.0	100.0	386.5	175.0	0.0	55.4	118.7	295.0	0.0	99.3	381.4
60.0	0.0	100.0	386.7	180.0	0.0	55.3	118.2	300.0	0.0	100.0	386.7
65.0	0.0	99.3	381.4	185.0	0.0	55.4	118.7	305.0	0.0	100.0	386.5
70.0	0.0	99.1	380.0	190.0	0.0	55.8	120.3	310.0	0.0	99.2	380.8
75.0	0.0	98.3	373.6	195.0	0.0	56.3	122.8	315.0	0.0	98.8	377.5
80.0	0.0	96.3	358.5	200.0	0.0	57.1	126.1	320.0	0.0	98.8	377.5
85.0	0.0	94.3	343.8	205.0	0.0	58.3	131.4	325.0	0.0	98.8	377.5
90.0	0.0	92.3	329.3	210.0	0.0	59.4	136.5	330.0	0.0	98.8	377.5
95.0	0.0	90.0	312.9	215.0	0.0	61.0	144.0	335.0	0.0	98.3	373.6
100.0	0.0	86.2	287.1	220.0	0.0	62.8	152.7	340.0	0.0	98.3	373.6
105.0	0.0	83.0	266.7	225.0	0.0	65.3	165.1	345.0	0.0	98.3	373.6
110.0	0.0	79.7	245.9	230.0	0.0	68.2	179.6	350.0	0.0	98.3	373.6
115.0	0.0	75.6	221.0	235.0	0.0	70.6	192.7	355.0	0.0	98.3	373.6

## Exhibit 8

### Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Pattern rotated to 198.0°T)

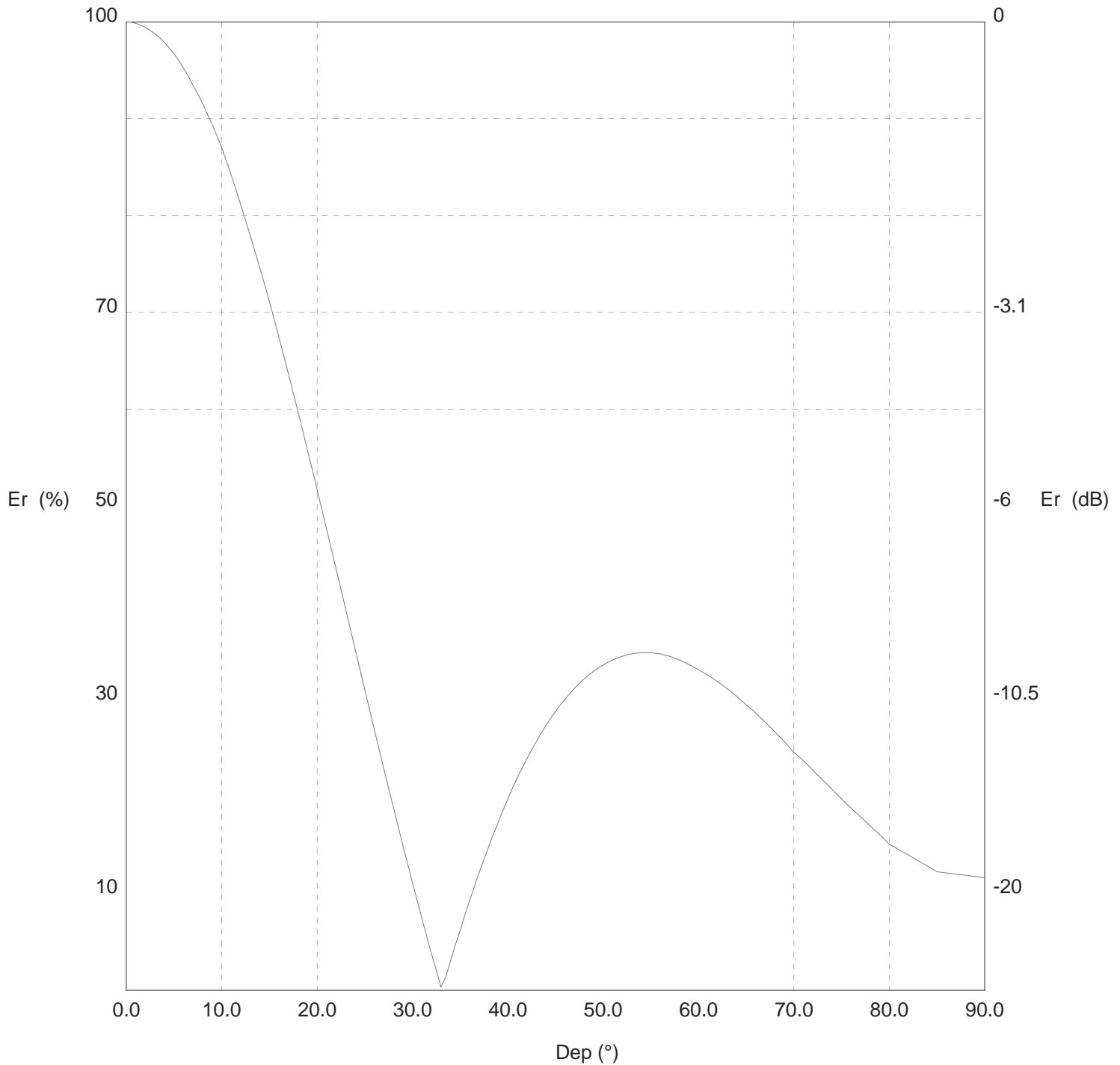
(public record copy)

TX station: BKG77-2(0.85WL)

Site name: 0.85 WAVE SEPARATION

Frequency: 98.10 MHz

Vertical diagram



— 0.0° Az. (Total antenna)

# Exhibit 8

## Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Pattern rotated to 198.0°T) (public record copy)

TX station: BKG77-2(0.85WL)

Site name: 0.85 WAVE SEPARATION

Frequency: 98.10 MHz

### Vertical diagram at an azimuth of 0° degrees

Dep (°)	Er (%)	ERP (W)	Dep (°)	Er (%)	ERP (W)	Dep (°)	Er (%)	ERP (W)
0.0	100.0	914.2	30.0	11.2	11.5	60.0	33.1	100.1
0.5	100.0	913.3	30.5	9.3	7.9	60.5	32.8	98.4
1.0	99.8	911.3	31.0	7.5	5.1	61.0	32.5	96.7
1.5	99.7	908.1	31.5	5.6	2.9	61.5	32.2	94.8
2.0	99.4	903.9	32.0	3.8	1.3	62.0	31.9	92.8
2.5	99.1	898.4	32.5	2.1	0.4	62.5	31.5	90.8
3.0	98.8	891.9	33.0	0.3	0.0	63.0	31.1	88.7
3.5	98.4	884.3	33.5	1.4	0.2	63.5	30.8	86.5
4.0	97.9	875.7	34.0	3.0	0.8	64.0	30.4	84.2
4.5	97.3	865.9	34.5	4.6	2.0	64.5	29.9	81.9
5.0	96.7	855.2	35.0	6.2	3.5	65.0	29.5	79.5
5.5	96.0	842.7	35.5	7.8	5.5	65.5	29.1	77.2
6.0	95.2	829.2	36.0	9.3	7.9	66.0	28.6	74.8
6.5	94.4	814.9	36.5	10.7	10.5	66.5	28.2	72.5
7.0	93.5	799.7	37.0	12.1	13.5	67.0	27.7	70.0
7.5	92.6	783.6	37.5	13.5	16.7	67.5	27.2	67.6
8.0	91.6	766.9	38.0	14.9	20.2	68.0	26.7	65.1
8.5	90.5	749.4	38.5	16.1	23.8	68.5	26.2	62.7
9.0	89.4	731.2	39.0	17.4	27.7	69.0	25.7	60.2
9.5	88.3	712.5	39.5	18.6	31.6	69.5	25.1	57.8
10.0	87.1	693.1	40.0	19.8	35.7	70.0	24.6	55.3
10.5	85.7	670.8	40.5	20.9	39.8	70.5	24.1	53.3
11.0	84.2	648.2	41.0	21.9	43.9	71.0	23.7	51.2
11.5	82.7	625.3	41.5	22.9	48.1	71.5	23.2	49.2
12.0	81.2	602.3	42.0	23.9	52.2	72.0	22.7	47.2
12.5	79.6	579.0	42.5	24.8	56.4	72.5	22.2	45.2
13.0	78.0	555.7	43.0	25.7	60.4	73.0	21.7	43.2
13.5	76.3	532.4	43.5	26.5	64.4	73.5	21.2	41.3
14.0	74.6	509.1	44.0	27.3	68.3	74.0	20.7	39.3
14.5	72.9	485.8	44.5	28.1	72.1	74.5	20.2	37.4
15.0	71.1	462.7	45.0	28.8	75.8	75.0	19.7	35.5
15.5	69.3	439.1	45.5	29.5	79.3	75.5	19.3	33.9
16.0	67.4	415.8	46.0	30.1	82.7	76.0	18.8	32.4
16.5	65.6	392.9	46.5	30.7	85.9	76.5	18.4	30.8
17.0	63.6	370.3	47.0	31.2	88.9	77.0	17.9	29.3
17.5	61.7	348.1	47.5	31.7	91.8	77.5	17.4	27.8
18.0	59.8	326.5	48.0	32.1	94.4	78.0	17.0	26.4
18.5	57.8	305.3	48.5	32.6	96.9	78.5	16.5	24.9
19.0	55.8	284.7	49.0	32.9	99.2	79.0	16.0	23.5
19.5	53.8	264.7	49.5	33.3	101.2	79.5	15.6	22.1
20.0	51.8	245.3	50.0	33.6	103.1	80.0	15.1	20.8
20.5	49.7	226.1	50.5	33.9	104.8	80.5	14.8	20.0
21.0	47.6	207.5	51.0	34.1	106.3	81.0	14.5	19.3
21.5	45.6	189.8	51.5	34.3	107.6	81.5	14.3	18.6
22.0	43.5	172.8	52.0	34.5	108.7	82.0	14.0	17.8
22.5	41.4	156.7	52.5	34.6	109.6	82.5	13.7	17.1
23.0	39.3	141.3	53.0	34.7	110.3	83.0	13.4	16.4
23.5	37.2	126.8	53.5	34.8	110.8	83.5	13.1	15.7
24.0	35.2	113.0	54.0	34.9	111.1	84.0	12.8	15.0
24.5	33.1	100.1	54.5	34.9	111.2	84.5	12.5	14.4
25.0	31.0	88.1	55.0	34.9	111.1	85.0	12.2	13.7
25.5	29.0	76.8	55.5	34.8	110.7	85.5	12.2	13.6
26.0	26.9	66.3	56.0	34.7	110.2	86.0	12.1	13.4
26.5	24.9	56.7	56.5	34.6	109.4	86.5	12.1	13.3
27.0	22.9	47.9	57.0	34.5	108.5	87.0	12.0	13.2
27.5	20.9	39.9	57.5	34.3	107.5	87.5	11.9	13.0
28.0	18.9	32.7	58.0	34.1	106.3	88.0	11.9	12.9
28.5	17.0	26.3	58.5	33.9	104.9	88.5	11.8	12.8
29.0	15.0	20.6	59.0	33.6	103.5	89.0	11.7	12.6
29.5	13.1	15.7	59.5	33.4	101.8	89.5	11.7	12.5