

# Technical Report Supporting a Form 349 Minor Change in Licensed Facility Construction Permit Application

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

*for*

*W232BW.L - Amherst, MA  
(Facility ID: 84372)*

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*"New Directional Antenna Pattern  
and Increase in Power"*

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*as a*

*Commercial, Fill-In Translator for  
WLZX-FM-HD2 - Northampton, MA*

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July, 2018

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## **Supplemental Appendix(s):**

RF Appendix 1 - Radio Frequency Radiation Compliance Showing

**EXPLANATION OF PROPOSAL:** This Form 349 Filing and accompanying technical report supports a Minor Change in Licensed Facility Construction Permit Application for FM Fill-In Translator W232BW.L - Amherst, MA (Facility ID: 84372). This FCC Form 349 Filing requests a new directional antenna pattern and increase in power from the same site location. Continued operation on CH232D (94.3 MHz) with 0.250 kW ERP Circular Polarization with separate horizontal and vertical elements is requested. Antenna COR's of 404 meters (H) AMSL and 401 meters (V) AMSL are requested. This Form 349 Filing will specify rebroadcast of the digital HD2 subchannel of Class A, commercial Primary Station WLZX-FM-HD2 - Northampton, MA (CH257A, 99.3 MHz); Facility ID No. 46963. The Translator will continue to provide service to the community of Amherst, MA.

**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 inside the larger FM primary daytime 60 dB $\mu$  contour. 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 1028013. In support of the requested site location, 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 FCC 30 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 WMAS-FM - Enfield, CT (CH234B) and WRSI(FM) - Turners Falls, MA (CH230A). 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 WMAS-FM - Enfield, CT (CH234B) and WRSI(FM) - Turners Falls, MA (CH230A). The Interference Contour at the proposed Translator site has been calculated to be no less than the 101.10 dBμ F(50:10) interference contour corresponding to the worst case protected contour at the Translator site. This represents the proposed interference contour which falls wholly within the 40:1 dB ratio. As seen in the **Exhibit 8** Aerial Photograph, there is a lack of population, housing, buildings or major roads within this interference contour. The applicant would like to note the existence of the dedicated transmitter building located at the base of the tower. However, structures of this nature have been exempt as a matter of FCC Policy. A copy of the manufacturer's directional antenna pattern data has been included in **Exhibit 9**.

There are two 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-b)**. Concerning protection of W232CG.A - Brattleboro, VT (BPFT-20180420ABM), a continuation of existing 47 C.F.R. Section 74.1204(c) Contour Overlap has been requested as noted in **Exhibit(s) 7a(1-2)**. Existing contour overlap will be reduced, thus not inhibiting W232CG.A's right to processing. It is believed sufficient clearance exists precluding the need for additional contour protection showings. A copy of the antenna manufacturer specifications has been included in **Exhibit 9**.

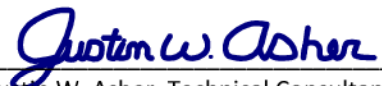
Regarding protection of international concerns, the facility is, and will remain, within 320 km from the common border between the United States and Canada. However full protection will be afforded all Canadian concerns as noted in **Exhibit 6**.



**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 existing antenna is being modified on the 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 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  
July 02, 2018

FCC 30 SEC Terrain Database  
US Census 2010 PL Database

Terrain  
11 582 m

# Exhibit 1

## Service Contour Study: Present vs Proposed Operations

*Present 60 dBμ F(50:50) Contour*

*Proposed 60 dBμ F(50:50) Contour*

W232BW.L +  
W232BW.P

W232BW.L  
Amherst, MA  
BLFT20110422AAO  
Facility ID: 84372  
Latitude: 42-21-49 N  
Longitude: 072-25-24 W  
ERP: 0.20 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 404.0 m  
Horiz. Pattern: Directional

60 dBμ F(50:50) Contour  
Total Population: 64,119  
Total Area: 373.6 sq. km

W232BW.P  
Amherst, MA  
Proposed Operation  
Facility ID: 84372  
Latitude: 42-21-49 N  
Longitude: 072-25-24 W  
ERP: 0.25 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 404.0 m  
Horiz. Pattern: Directional

60 dBμ F(50:50) Contour  
Total Population: 109,645  
Total Area: 873.5 sq. km

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

Scale 1:250,000  
0 3 6 9 km

V-Soft Communications LLC ©

**Primary 60 dBμ F(50:50) Contour**

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

**Proposed 60 dBμ F(50:50) Contour**

**WLZX-FM-HD2**

Hampshire

**W232BW.P**

Hampden

**WLZX-FM-HD2**  
Northampton, MA  
BLH20000112ABC  
BDNH-20131202AKP  
Facility ID: 46963  
Latitude: 42-22-25 N  
Longitude: 072-40-26 W  
ERP: 5.80 kW  
Channel: 257A (99.3 MHz)  
AMSL Height: 268.0 m  
Pattern: Omni

**W232BW.P**  
Amherst, MA  
Proposed Operation  
Facility ID: 84372  
Latitude: 42-21-49 N  
Longitude: 072-25-24 W  
ERP: 0.25 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 404.0 m  
Pattern: Directional

Terrain  
6 945 m

FCC 30 SEC Terrain Database  
US Census 2010 PL Database

Scale 1:425,000  
0 6 12 18 km

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V-Soft Communications LLC ©

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

**Registration Detail**

Reg Number	1028013	Status	Constructed
File Number	A0033239	Constructed	05/21/1997
EMI	No	Dismantled	
NEPA	No		

**Antenna Structure**

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

**Location** (in NAD83 Coordinates)

Lat/Long	42-21-49.0 N 072-25-22.0 W	Address	SUMMIT OF MOUNT LINCOLN
City, State	PELHAM , MA		
Zip	01002	County	HAMPSHIRE
Center of AM Array		Position of Tower in Array	

**Heights (meters)**

Elevation of Site Above Mean Sea Level	Overall Height Above Ground (AGL)
377.3	106.4
Overall Height Above Mean Sea Level	Overall Height Above Ground w/o Appurtenances
483.7	105.5

**Painting and Lighting Specifications**

FAA Chapters 3, 4, 5, 13  
Paint and Light in Accordance with FAA Circular Number 70/7460-1H

**FAA Notification**

FAA Study	94-ANE-061-OE	FAA Issue Date	03/21/1994
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**Owner & Contact Information**

FRN	Owner Entity Type
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**Owner**

UNIVERSITY OF MASSACHUSETTS DBA = WFCR	P: (413)545-0100
Attention To: MARTIN MILLER	F:
HAMPSHIRE HOUSE	E:
AMHERST , MA 01003-3630	

**Contact**

P:  
F:  
E:

**Last Action Status**

Status	Constructed	Received	08/20/1997
Purpose	New	Entered	08/20/1997
Mode	Interactive		

**Related Applications**

08/20/1997	A0033239 - New (NE)
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**Comments**

**Comments**

None

**History**

**Date**

**Event**

None

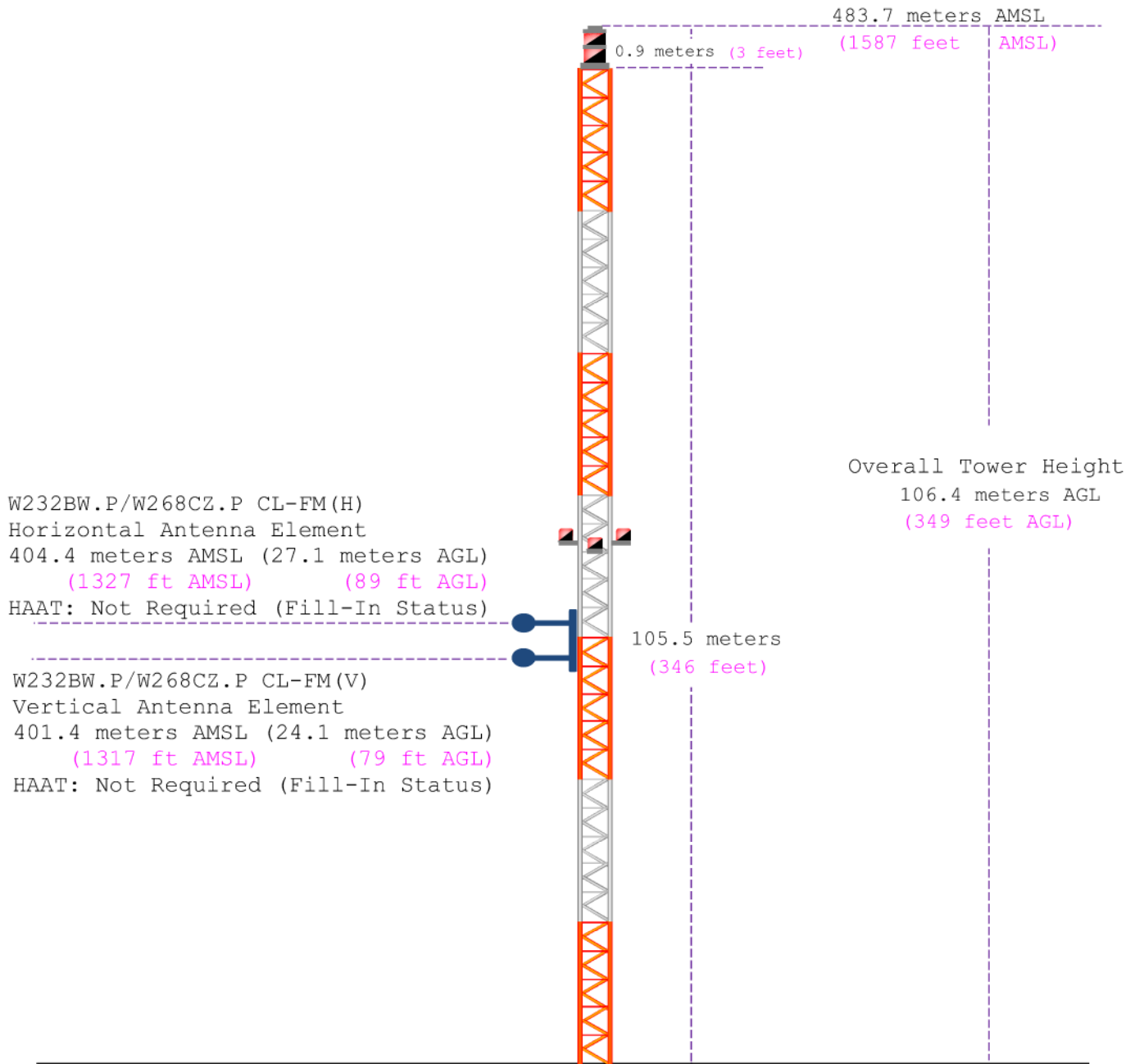
**Automated Letters**

None



# Exhibit 4

## Vertical Plan of Antenna System



Ground Elevation: 377.3 meters AMSL (1238 feet AMSL)		
Address: Summit of Mount Lincoln		
City: Pelham	Latitude (D M S) Longitude (D M S)	
County: Hampshire	NAD 27 datum values: 42 21 48.67454 72 25 23.69319	
State: Massachusetts	NAD 83 datum values: 42 21 49.00000 72 25 22.00000	
Antenna Structure Registration 1028013	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. = 422149.0    W. Lng. = 722524.0  
 HAAT and Distance to Contour,  
 FCC, FM 2-10 Mi, 51 pts Method - FCC 30 SEC

Azi.	AV EL	HAAT	ERP kW	dBk	Field	60-F5
000	333.5	70.5	0.1600	-7.96	0.800	9.79
030	252.8	151.2	0.1600	-7.96	0.800	14.18
060	211.2	192.8	0.1600	-7.96	0.800	16.15
090	211.8	192.2	0.0225	-16.48	0.300	9.95
120	201.5	202.5	0.0400	-13.98	0.400	11.72
150	201.5	202.5	0.2500	-6.02	1.000	18.64
180	151.1	252.9	0.0400	-13.98	0.400	13.03
210	100.2	303.8	0.0400	-13.98	0.400	14.31
240	104.8	299.2	0.1600	-7.96	0.800	20.23
270	63.1	340.9	0.2500	-6.02	1.000	23.99
300	75.5	328.5	0.2025	-6.94	0.900	22.41
330	180.9	223.1	0.0506	-12.96	0.450	12.98

Ave El= 173.99 M    HAAT= 230.01 M    AMSL= 404

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

	<u>Latitude</u>	<u>Longitude</u>
NAD 27 datum values:	42 21 48.67454	72 25 23.69319
NAD 83 datum values:	42 21 49.00000	72 25 22.00000

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

Position Type	Lat Lon
<b>Degrees Lat Long</b>	42.3636111°, -072.4227778°
<b>Degrees Minutes</b>	42°21.81667', -072°25.36667'
<b>Degrees Minutes Seconds</b>	42°21'49.0000", -072°25'22.0000"
<b>UTM</b>	18T 712226mE 4693366mN
<b>UTM centimeter</b>	18T 712226.69mE 4693366.24mN
<b>MGRS</b>	18TYM1222693366
<b>Grid North</b>	1.7°
<b>GARS</b>	216MA14
<b>Maidenhead</b>	FN32SI97GG44
<b>GEOREF</b>	HJCN34632181

# Exhibit 6

## Tabulation of Proposed Allocation

Blue Text indicates contour protection studies toward select allocation concern(s) as included in **Exhibit(s) 7(a-b)**. Concerning protection of W232CG.A - Brattleboro, VT (BPFT-20180420ABM), a continuation of existing 47 C.F.R. Section 74.1204(c) Contour Overlap has been requested as noted in **Exhibit(s) 7a(1-2)**. Existing contour overlap will be reduced, thus not inhibiting W232CG.A's right to processing.

Yellow Highlighted 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**.

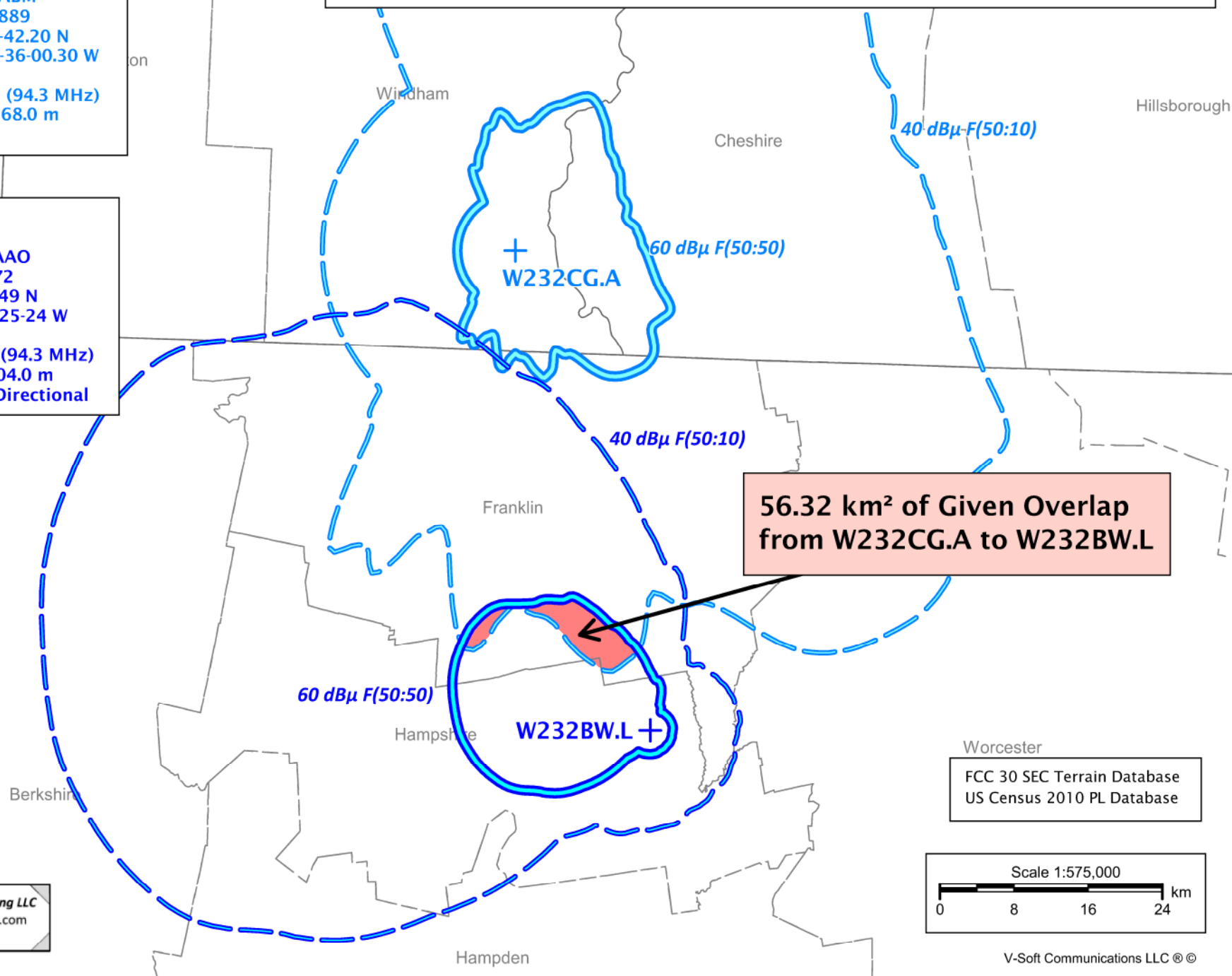
Saga Communications Of New England, Llc											
REFERENCE		CH#	232D - 94.3 MHz, Pwr= 0.25 kW DA, HAAT= 230.0 M, COR= 404 M					DISPLAY DATES			
42 21 49.0 N.			Average Protected F(50-50)= 19.85 km					DATA 06-29-18			
72 25 24.0 W.			Standard Directional					SEARCH 06-29-18			
CH	CALL	TYPE	ANT	AZI	DIST	LAT	PWR (kW)	INT (km)	PRO (km)	*IN*	*OUT*
CITY		STATE		<--	FILE #	LNG	HAAT (M)	COR (M)	LICENSEE	(Overlap in km)	
232D	W232BW	LIC DC		0.0	0.00	42 21 49.0	0.200		---Reference---		
Amherst		MA		0.0	BLFT20110422AAO	72 25 24.0	230	404	Saga Communications Of Ne		
234B	WMAS-FM	LIC CX		208.7	32.23	42 06 33.0	50.000	3.5	45.4	8.7	-14.0*<
Enfield		CT		28.6	BLH20111107ARY	72 36 40.0	55	117	Radio License Holding Cbc,		
230A	WRSI	LIC CN		323.7	23.46	42 32 01.0	2.500	2.4	27.1	6.7	-4.2*<
Turners Falls		MA		143.6	BLH19951018KB	72 35 34.0	109	284	Saga Communications Of Ne		
232D	W232CG	APP C		344.4	53.66	42 49 42.2	0.150	45.6	13.7	-2.6<	4.2
Brattleboro		VT		164.3	BPFT20180420ABM	72 36 00.3		368	Vermont Public Radio		
232D	W232CG	LIC C		344.6	53.66	42 49 44.0	0.190	37.6	11.1	5.5	6.9
Brattleboro		VT		164.5	BLFT20121113ABM	72 35 52.0	31	307	Vermont Public Radio		
233B	WJMN	LIC CX		93.2	98.75	42 18 27.0	9.200	77.3	65.7	7.6	12.2
Boston		MA		274.0	BLH20031201AWA	71 13 27.0	353	394	Amfm Radio Licenses, L.l.c		
231B	WHJY	LIC C		124.1	105.41	41 49 40.0	50.000	71.7	59.1	12.6	15.1
Providence		RI		304.8	BLH20000915ALB	71 22 09.0	139	170	Capstar Tx, Llc, As Debtor		
232A	WBTN-FM	LIC NCX		316.8	89.49	42 56 52.9	3.000	53.3	13.2	19.6	22.7
Bennington		VT		136.3	BMLED20110511AGV	73 10 33.9	34	474	Vermont Public Radio		
229B	WZMX	LIC CX		201.5	95.67	41 33 44.0	17.000	5.7	66.2	71.9	28.8
Hartford		CT		21.2	BMLH20080306AAR	72 50 42.0	259	359	Cbs Radio Stations Inc.		
232A	WYBC-FM	LIC DE		202.2	121.56	41 20 59.0	3.000	79.9	26.6	28.8	52.2
New Haven		CT		21.8	BLH20010918AAT	72 58 23.0	144	215	Yale Broadcasting Company,		
235D	W235AV	LIC DC		97.9	43.13	42 18 34.0	0.230	0.2	6.7	33.2	36.1
Tatnuck		MA		278.2	BLFT20070725AAR	71 54 13.0	232	474	Amfm Radio Licenses, L.l.c		
231D	W231AK	LIC C		258.0	77.61	42 12 53.0	0.250	10.1	7.1	43.6	34.6
Great Barrington		MA		77.4	BLFT20130322AFJ	73 20 43.0	-72	279	Townsquare Media Pittsfiel		
232A	WKXP	LIC CX		248.6	139.43	41 53 44.0	2.250	81.6	28.1	35.2	42.3
Kingston		NY		67.6	BLH20040120ADV	73 59 32.0	166	260	Townsquare Media Poughkeep		
285A	WYRY	LIC DC		356.8	45.86	42 46 33.0	4.100	171.7	72.2	9.5R	36.4M
Hinsdale		NH		176.8	BLH20010402AAV	72 27 17.0	122	344	Tri-valley Broadcasting Co		
231D	W231CZ	LIC C		206.2	70.18	41 47 47.6	0.032	17.6	12.0	39.0	38.0
Hartford		CT		25.9	BLFT20170103AAU	72 47 49.6		294	Educational Media Foundati		

Terrain database is FCC NGDC 30 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= 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.  
 « = Station meets FCC minimum distance spacing for its class.  
 < = Contour Overlap  
 Reference station has protected zone issue: Canada

**Exhibit 7a(1) - Licensed to Application Operations**  
**47 C.F.R. Section 74.1204(c) Existing Contour Overlap Request**

**W232CG.A**  
Brattleboro, VT  
BPFT20180420ABM  
Facility ID: 139889  
Latitude: 42-49-42.20 N  
Longitude: 072-36-00.30 W  
ERP: 0.15 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 368.0 m  
Pattern: Omni

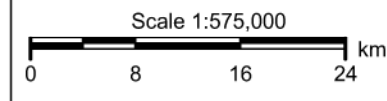
**W232BW.L**  
Amherst, MA  
BLFT20110422AAO  
Facility ID: 84372  
Latitude: 42-21-49 N  
Longitude: 072-25-24 W  
ERP: 0.20 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 404.0 m  
Horiz. Pattern: Directional



**56.32 km² of Given Overlap**  
**from W232CG.A to W232BW.L**

Asher Broadcast Consulting LLC  
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1 (202) 875-2986

Worcester  
FCC 30 SEC Terrain Database  
US Census 2010 PL Database



V-Soft Communications LLC ©



## Exhibit 7a(1)

### Contour Protection Studies Toward Select Allocation Concern(s)

06-29-2018

Terrain Data: FCC NGDC 30 Sec

FMOver Analysis

W232BW.L

W232CG BPFT20180420ABM

Channel = 232D

Max ERP = 0.2 kW

RCAMSL = 404 m

N. Lat. 42 21 49.0

W. Lng. 72 25 24.0

Protected

60 dBu

Channel = 232D

Max ERP = 0.15 kW

RCAMSL = 368 m

N. Lat. 42 49 42.2

W. Lng. 72 36 00.3

Interfering

40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
287.0	000.1847	0336.2	022.2	188.4	000.0443	0117.4	045.7	33.11	
288.0	000.1870	0335.5	022.2	188.4	000.0443	0117.6	045.3	33.28	
289.0	000.1897	0334.8	022.3	188.4	000.0443	0117.7	044.9	33.45	
290.0	000.1921	0334.2	022.3	188.3	000.0443	0118.1	044.5	33.63	
291.0	000.1929	0333.7	022.3	188.2	000.0443	0119.1	044.2	33.85	
292.0	000.1937	0333.2	022.3	188.1	000.0443	0120.1	043.8	34.08	
293.0	000.1944	0332.7	022.3	188.0	000.0444	0121.2	043.4	34.30	
294.0	000.1952	0332.3	022.3	187.9	000.0444	0122.4	043.0	34.53	
295.0	000.1960	0332.0	022.3	187.8	000.0445	0123.5	042.6	34.76	
296.0	000.1968	0331.6	022.4	187.6	000.0445	0124.5	042.3	34.98	
297.0	000.1976	0331.1	022.4	187.4	000.0446	0125.4	041.9	35.20	
298.0	000.1984	0330.4	022.4	187.3	000.0446	0126.1	041.5	35.40	
299.0	000.1992	0329.6	022.4	187.1	000.0447	0126.6	041.2	35.59	
300.0	000.2000	0328.5	022.3	186.8	000.0448	0126.9	040.8	35.77	
301.0	000.1992	0327.1	022.3	186.5	000.0449	0127.2	040.5	35.95	
302.0	000.1984	0325.4	022.2	186.2	000.0450	0127.2	040.2	36.10	
303.0	000.1976	0323.5	022.1	185.8	000.0451	0126.7	039.9	36.22	
304.0	000.1968	0321.6	022.0	185.5	000.0452	0125.5	039.6	36.30	
305.0	000.1960	0319.4	021.9	185.1	000.0453	0123.4	039.3	36.31	
306.0	000.1952	0316.8	021.8	184.7	000.0455	0120.8	039.0	36.30	
307.0	000.1944	0313.4	021.7	184.2	000.0456	0117.4	038.7	36.21	
308.0	000.1937	0309.1	021.5	183.7	000.0458	0112.8	038.5	36.01	
309.0	000.1929	0303.7	021.3	183.1	000.0460	0107.8	038.3	35.74	
310.0	000.1921	0297.0	021.1	182.5	000.0462	0104.2	038.2	35.54	
311.0	000.1897	0289.2	020.7	181.7	000.0465	0101.5	038.1	35.38	
312.0	000.1870	0280.5	020.4	181.0	000.0467	0098.6	038.1	35.16	
313.0	000.1847	0271.4	020.0	180.2	000.0470	0095.6	038.1	34.92	
314.0	000.1820	0263.4	019.6	179.4	000.0484	0096.5	038.1	35.13	
315.0	000.1797	0256.3	019.3	178.7	000.0501	0098.3	038.1	35.45	
316.0	000.1775	0250.0	019.0	178.0	000.0518	0100.1	038.1	35.74	
317.0	000.1748	0244.1	018.7	177.4	000.0534	0101.4	038.1	35.99	
318.0	000.1726	0240.5	018.5	176.8	000.0549	0102.0	038.0	36.18	
319.0	000.1700	0239.3	018.4	176.3	000.0561	0102.3	037.9	36.35	

***Exhibit 7a(1)***  
***Contour Protection Studies Toward Select Allocation Concern(s)***

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
320.0	000.1678	0238.7	018.3	175.8	000.0573	0102.8	037.8	36.54
321.0	000.1642	0237.1	018.1	175.3	000.0587	0103.6	037.7	36.73
322.0	000.1606	0234.3	017.9	174.7	000.0603	0105.2	037.7	36.97
323.0	000.1570	0230.6	017.7	174.1	000.0619	0107.4	037.8	37.24
324.0	000.1535	0226.5	017.4	173.5	000.0635	0110.7	037.9	37.57
325.0	000.1503	0222.5	017.1	172.9	000.0651	0115.5	037.9	37.99
326.0	000.1469	0220.2	016.9	172.4	000.0666	0120.6	038.0	38.40
327.0	000.1435	0220.2	016.8	171.9	000.0680	0124.9	038.0	38.76
328.0	000.1401	0222.1	016.8	171.5	000.0692	0128.3	037.9	39.08
329.0	000.1368	0224.0	016.8	171.1	000.0704	0131.6	037.8	39.39
330.0	000.1335	0223.1	016.6	170.6	000.0718	0135.2	037.8	39.68
331.0	000.1293	0218.5	016.3	170.0	000.0735	0138.8	038.0	39.88
332.0	000.1255	0210.8	015.8	169.4	000.0758	0142.2	038.3	40.06* 0.12
333.0	000.1214	0202.0	015.3	168.8	000.0781	0146.1	038.7	40.22* 0.48
334.0	000.1174	0193.1	014.9	168.2	000.0803	0149.5	039.1	40.35* 0.75
335.0	000.1134	0184.2	014.4	167.7	000.0823	0151.5	039.5	40.39* 0.84
336.0	000.1098	0174.7	014.0	167.2	000.0843	0152.4	039.9	40.35* 0.76
337.0	000.1060	0165.0	013.4	166.8	000.0862	0152.5	040.4	40.23* 0.51
338.0	000.1022	0155.5	012.9	166.3	000.0881	0151.7	040.9	40.05* 0.11
339.0	000.0988	0147.4	012.4	165.9	000.0897	0150.4	041.3	39.87
340.0	000.0952	0142.9	012.1	165.6	000.0911	0149.2	041.6	39.74
341.0	000.0911	0141.3	011.9	165.3	000.0924	0148.4	041.8	39.68
342.0	000.0874	0140.5	011.8	165.0	000.0937	0147.7	041.9	39.64
343.0	000.0835	0137.6	011.5	164.7	000.0950	0147.1	042.2	39.55
344.0	000.0799	0132.8	011.2	164.4	000.0961	0146.4	042.5	39.43
345.0	000.0761	0126.3	010.8	164.2	000.0973	0145.7	042.9	39.27
346.0	000.0725	0119.2	010.4	163.9	000.0983	0145.1	043.3	39.10
347.0	000.0691	0112.4	010.0	163.7	000.0992	0144.5	043.7	38.93
348.0	000.0657	0109.4	009.7	163.5	000.1001	0143.9	044.0	38.83
349.0	000.0625	0107.8	009.5	163.3	000.1009	0143.2	044.2	38.74
350.0	000.0592	0105.1	009.3	163.1	000.1017	0142.5	044.4	38.63
351.0	000.0560	0100.8	009.0	163.0	000.1024	0141.8	044.8	38.48
352.0	000.0526	0097.0	008.7	162.8	000.1030	0141.2	045.1	38.34
353.0	000.0496	0093.9	008.4	162.7	000.1036	0140.5	045.4	38.20
354.0	000.0465	0090.8	008.1	162.6	000.1041	0139.9	045.7	38.06
355.0	000.0436	0087.4	007.8	162.5	000.1045	0139.2	046.0	37.91
356.0	000.0409	0084.0	007.5	162.4	000.1049	0138.7	046.3	37.77
357.0	000.0380	0080.0	007.2	162.4	000.1051	0138.2	046.7	37.62
358.0	000.0354	0075.8	006.9	162.3	000.1053	0137.9	047.0	37.48
359.0	000.0328	0071.7	006.6	162.3	000.1055	0137.6	047.3	37.34
000.0	000.0304	0070.5	006.4	162.2	000.1058	0137.0	047.5	37.24
001.0	000.0274	0070.0	006.2	162.2	000.1061	0136.5	047.7	37.15
002.0	000.0245	0069.5	006.0	162.1	000.1063	0136.1	047.9	37.05
003.0	000.0218	0068.8	005.8	162.1	000.1065	0135.8	048.2	36.96
004.0	000.0192	0068.7	005.7	162.1	000.1066	0135.5	048.4	36.87
005.0	000.0168	0069.9	005.5	162.0	000.1068	0135.1	048.5	36.80
006.0	000.0146	0073.0	005.5	161.9	000.1071	0134.5	048.6	36.73
007.0	000.0125	0077.7	005.4	161.9	000.1075	0133.7	048.7	36.68
008.0	000.0106	0084.3	005.4	161.7	000.1080	0132.7	048.7	36.63
009.0	000.0088	0092.3	005.4	161.6	000.1085	0131.7	048.8	36.59
010.0	000.0072	0098.7	005.4	161.6	000.1087	0131.2	048.9	36.52

***Exhibit 7a(1)***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
011.0	000.0062	0103.2	005.3	161.5	000.1089	0130.7	049.0	36.46
012.0	000.0052	0106.0	005.1	161.5	000.1090	0130.7	049.2	36.39
013.0	000.0044	0110.0	005.0	161.5	000.1089	0130.7	049.4	36.32
014.0	000.0036	0115.6	004.8	161.5	000.1089	0130.7	049.5	36.26
015.0	000.0029	0119.1	004.6	161.6	000.1087	0131.3	049.8	36.19
016.0	000.0022	0120.4	004.3	161.7	000.1082	0132.3	050.0	36.11
017.0	000.0017	0120.1	004.0	161.9	000.1075	0133.8	050.4	36.04
018.0	000.0012	0121.7	003.6	162.0	000.1068	0135.2	050.7	35.97
019.0	000.0008	0126.3	003.3	162.2	000.1060	0136.7	051.0	35.89
020.0	000.0005	0132.4	002.9	162.4	000.1050	0138.5	051.3	35.81
021.0	000.0005	0137.4	002.9	162.4	000.1051	0138.3	051.4	35.78
022.0	000.0004	0140.6	002.8	162.4	000.1051	0138.2	051.4	35.75
023.0	000.0004	0143.4	002.8	162.4	000.1051	0138.2	051.5	35.72
024.0	000.0004	0147.3	002.7	162.4	000.1052	0138.2	051.6	35.70
025.0	000.0003	0151.2	002.7	162.4	000.1051	0138.2	051.7	35.67
026.0	000.0003	0152.3	002.6	162.4	000.1050	0138.4	051.8	35.64
027.0	000.0003	0150.5	002.5	162.4	000.1048	0138.7	051.9	35.61
028.0	000.0002	0149.1	002.4	162.5	000.1047	0139.0	052.0	35.58
029.0	000.0002	0149.8	002.3	162.5	000.1045	0139.2	052.0	35.55
030.0	000.0002	0151.2	002.2	162.6	000.1043	0139.5	052.1	35.52
031.0	000.0002	0152.2	002.2	162.5	000.1044	0139.3	052.2	35.51
032.0	000.0002	0152.8	002.2	162.5	000.1046	0139.1	052.2	35.49
033.0	000.0002	0154.1	002.2	162.5	000.1047	0138.9	052.2	35.47
034.0	000.0002	0157.7	002.2	162.4	000.1049	0138.6	052.2	35.46
035.0	000.0002	0163.0	002.3	162.4	000.1051	0138.2	052.2	35.44
036.0	000.0002	0167.8	002.3	162.3	000.1053	0137.9	052.3	35.42
037.0	000.0002	0171.1	002.3	162.3	000.1055	0137.5	052.3	35.40
038.0	000.0002	0172.5	002.3	162.3	000.1056	0137.3	052.3	35.39
039.0	000.0002	0172.3	002.3	162.2	000.1058	0137.1	052.4	35.37
040.0	000.0002	0171.3	002.3	162.2	000.1058	0136.9	052.4	35.35
041.0	000.0002	0170.8	002.3	162.2	000.1059	0136.7	052.4	35.33
042.0	000.0002	0171.2	002.3	162.2	000.1061	0136.5	052.5	35.31
043.0	000.0002	0172.5	002.3	162.1	000.1062	0136.3	052.5	35.29

## Exhibit 7a(1)

### Contour Protection Studies Toward Select Allocation Concern(s)

06-29-2018

Terrain Data: FCC NGDC 30 Sec

FMOver Analysis

W232CG BPFT20180420ABM

W232BW.L

Channel = 232D

Max ERP = 0.15 kW

RCAMSL = 368 m

N. Lat. 42 49 42.2

W. Lng. 72 36 00.3

Protected

60 dBu

Channel = 232D

Max ERP = 0.2 kW

RCAMSL = 404 m

N. Lat. 42 21 49.0

W. Lng. 72 25 24.0

Interfering

40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
104.0	000.1500	0195.9	016.0	001.3	000.0264	0069.8	047.8	26.18	
105.0	000.1500	0202.5	016.3	001.6	000.0257	0069.7	047.5	26.16	
106.0	000.1500	0209.5	016.6	001.8	000.0249	0069.6	047.1	26.13	
107.0	000.1500	0217.6	016.9	002.1	000.0241	0069.3	046.7	26.08	
108.0	000.1500	0225.4	017.2	002.4	000.0233	0068.9	046.4	26.02	
109.0	000.1500	0233.1	017.5	002.7	000.0226	0068.8	046.0	26.00	
110.0	000.1500	0239.5	017.8	002.9	000.0221	0068.8	045.6	26.03	
111.0	000.1500	0242.4	017.9	002.9	000.0221	0068.8	045.3	26.14	
112.0	000.1500	0241.8	017.9	002.7	000.0225	0068.8	045.0	26.32	
113.0	000.1500	0237.8	017.7	002.4	000.0234	0069.0	044.8	26.59	
114.0	000.1500	0232.8	017.5	002.0	000.0244	0069.5	044.6	26.91	
115.0	000.1500	0228.3	017.3	001.7	000.0254	0069.7	044.3	27.19	
116.0	000.1500	0224.2	017.2	001.3	000.0264	0069.8	044.1	27.45	
117.0	000.1500	0219.9	017.0	000.9	000.0275	0070.0	043.9	27.72	
118.0	000.1500	0216.8	016.9	000.6	000.0285	0070.2	043.7	27.96	
119.0	000.1500	0215.8	016.8	000.4	000.0292	0070.3	043.5	28.16	
120.0	000.1500	0218.2	016.9	000.3	000.0294	0070.3	043.2	28.31	
121.0	000.1500	0223.2	017.1	000.4	000.0293	0070.3	042.8	28.43	
122.0	000.1500	0230.2	017.4	000.5	000.0290	0070.2	042.4	28.52	
123.0	000.1500	0238.1	017.7	000.6	000.0286	0070.2	042.0	28.62	
124.0	000.1500	0245.9	018.0	000.7	000.0282	0070.1	041.6	28.72	
125.0	000.1500	0252.9	018.3	000.8	000.0281	0070.1	041.2	28.85	
126.0	000.1500	0258.4	018.5	000.7	000.0282	0070.1	040.8	29.01	
127.0	000.1500	0262.2	018.6	000.6	000.0285	0070.2	040.4	29.20	
128.0	000.1500	0264.3	018.7	000.4	000.0291	0070.3	040.1	29.42	
129.0	000.1500	0265.0	018.7	000.2	000.0299	0070.4	039.9	29.65	
130.0	000.1500	0265.1	018.7	359.9	000.0307	0070.5	039.6	29.89	
131.0	000.1500	0264.6	018.7	359.5	000.0315	0070.7	039.4	30.11	
132.0	000.1500	0263.3	018.7	359.2	000.0324	0071.2	039.2	30.37	
133.0	000.1500	0261.0	018.6	358.8	000.0334	0072.6	039.0	30.74	
134.0	000.1500	0257.8	018.5	358.3	000.0346	0074.5	038.8	31.16	
135.0	000.1500	0254.2	018.3	357.8	000.0359	0076.5	038.7	31.58	
136.0	000.1500	0250.8	018.2	357.3	000.0371	0078.5	038.6	31.99	

***Exhibit 7a(1)***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
137.0	000.1500	0247.4	018.1	356.9	000.0384	0080.5	038.5	32.39
138.0	000.1500	0243.4	017.9	356.4	000.0398	0082.6	038.4	32.80
139.0	000.1500	0239.3	017.8	355.8	000.0413	0084.5	038.3	33.18
140.0	000.1500	0235.0	017.6	355.3	000.0427	0086.3	038.3	33.52
141.0	000.1500	0229.8	017.4	354.8	000.0442	0088.2	038.3	33.87
142.0	000.1500	0223.9	017.2	354.2	000.0459	0090.1	038.3	34.20
143.0	000.1500	0217.1	016.9	353.6	000.0477	0092.0	038.4	34.51
144.0	000.1500	0209.3	016.6	353.0	000.0496	0093.9	038.6	34.79
145.0	000.1500	0199.6	016.2	352.3	000.0516	0095.9	038.8	35.05
146.0	000.1500	0188.1	015.7	351.7	000.0538	0098.1	039.1	35.29
147.0	000.1500	0174.8	015.1	351.0	000.0561	0101.0	039.5	35.55
148.0	000.1500	0160.9	014.4	350.2	000.0584	0104.2	040.0	35.77
149.0	000.1500	0148.0	013.8	349.6	000.0606	0106.6	040.5	35.89
150.0	000.1500	0137.6	013.3	349.0	000.0625	0107.7	041.0	35.93
151.0	000.1500	0129.9	012.9	348.5	000.0640	0108.4	041.2	35.95
152.0	000.1500	0124.4	012.6	348.1	000.0652	0109.1	041.4	36.01
153.0	000.1500	0122.4	012.5	347.8	000.0663	0109.9	041.5	36.13
154.0	000.1500	0121.6	012.5	347.5	000.0674	0110.7	041.5	36.26
155.0	000.1500	0118.9	012.3	347.2	000.0685	0111.7	041.5	36.37
156.0	000.1500	0113.3	012.1	346.8	000.0698	0113.4	041.8	36.47
157.0	000.1500	0107.2	011.8	346.5	000.0709	0115.7	042.0	36.58
158.0	000.1500	0104.4	011.6	346.2	000.0720	0118.0	042.1	36.74
159.0	000.1500	0107.0	011.7	345.9	000.0728	0120.0	042.0	36.98
160.0	000.1500	0114.6	012.1	345.7	000.0737	0121.6	041.6	37.30
161.0	000.1500	0125.1	012.6	345.4	000.0745	0123.3	041.1	37.68
162.0	000.1500	0135.1	013.1	345.2	000.0755	0125.2	040.6	38.06
163.0	000.1500	0141.9	013.5	344.9	000.0767	0127.3	040.2	38.41
164.0	000.1500	0145.3	013.6	344.5	000.0779	0129.6	040.0	38.69
165.0	000.1500	0147.8	013.8	344.2	000.0792	0131.8	039.9	38.95
166.0	000.1500	0150.6	013.9	343.8	000.0805	0133.8	039.7	39.19
167.0	000.1500	0152.5	014.0	343.5	000.0818	0135.5	039.7	39.40
168.0	000.1500	0150.6	013.9	343.1	000.0830	0137.0	039.8	39.50
169.0	000.1500	0144.7	013.6	342.8	000.0841	0138.2	040.1	39.47
170.0	000.1500	0138.8	013.3	342.5	000.0852	0139.1	040.4	39.43
171.0	000.1500	0132.2	013.0	342.3	000.0862	0139.9	040.8	39.36
172.0	000.1500	0124.3	012.6	342.1	000.0871	0140.4	041.2	39.24
173.0	000.1500	0114.9	012.1	341.9	000.0878	0140.7	041.7	39.08
174.0	000.1500	0108.0	011.8	341.7	000.0884	0140.9	042.1	38.95
175.0	000.1500	0104.3	011.6	341.5	000.0892	0141.1	042.3	38.90
176.0	000.1500	0102.5	011.5	341.3	000.0901	0141.2	042.5	38.88
177.0	000.1500	0101.7	011.5	341.0	000.0910	0141.3	042.6	38.89
178.0	000.1500	0100.2	011.4	340.8	000.0919	0141.5	042.7	38.89
179.0	000.1500	0097.6	011.2	340.6	000.0927	0141.7	042.9	38.85
180.0	000.1500	0094.9	011.1	340.4	000.0935	0142.0	043.1	38.81
181.0	000.1500	0098.7	011.3	340.1	000.0949	0142.7	043.0	38.97
182.0	000.1500	0102.5	011.5	339.7	000.0962	0143.6	042.8	39.13
183.0	000.1500	0106.9	011.7	339.4	000.0975	0145.2	042.7	39.33
184.0	000.1500	0115.6	012.2	338.9	000.0993	0148.4	042.4	39.72
185.0	000.1500	0122.8	012.5	338.4	000.1009	0152.0	042.2	40.07* 0.17
186.0	000.1500	0127.0	012.7	338.0	000.1022	0155.4	042.1	40.34* 0.77
187.0	000.1500	0126.7	012.7	337.8	000.1032	0157.7	042.2	40.45* 1.01

***Exhibit 7a(1)***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	
188.0	000.1500	0121.4	012.5	337.7	000.1035	0158.5	042.6	40.35*	0.80
189.0	000.1500	0111.1	012.0	337.8	000.1031	0157.6	043.1	40.05*	0.12
190.0	000.1500	0100.0	011.4	337.9	000.1025	0156.0	043.7	39.68	
191.0	000.1500	0089.2	010.8	338.1	000.1017	0154.2	044.3	39.29	
192.0	000.1500	0078.8	010.2	338.4	000.1009	0152.2	044.9	38.90	
193.0	000.1500	0071.2	009.7	338.5	000.1004	0150.8	045.4	38.60	
194.0	000.1500	0066.8	009.4	338.6	000.1003	0150.6	045.7	38.44	
195.0	000.1500	0065.4	009.3	338.5	000.1006	0151.3	045.9	38.42	
196.0	000.1500	0066.3	009.4	338.3	000.1013	0153.0	046.0	38.52	
197.0	000.1500	0068.7	009.5	338.0	000.1023	0155.5	045.9	38.70	
198.0	000.1500	0070.4	009.6	337.7	000.1032	0157.8	046.0	38.84	
199.0	000.1500	0072.3	009.8	337.5	000.1042	0160.3	046.0	39.00	
200.0	000.1500	0077.0	010.1	337.1	000.1057	0164.2	045.9	39.31	
201.0	000.1500	0083.2	010.4	336.6	000.1076	0169.0	045.7	39.68	
202.0	000.1500	0088.8	010.8	336.1	000.1093	0173.4	045.6	40.00*	0.01
203.0	000.1500	0093.6	011.0	335.7	000.1108	0177.4	045.6	40.27*	0.66
204.0	000.1500	0095.5	011.1	335.5	000.1117	0180.0	045.7	40.40*	0.98
205.0	000.1500	0092.2	010.9	335.5	000.1117	0179.8	045.9	40.28*	0.68
206.0	000.1500	0086.9	010.6	335.6	000.1112	0178.4	046.3	40.06*	0.14
207.0	000.1500	0084.6	010.5	335.6	000.1112	0178.6	046.5	39.97	
208.0	000.1500	0085.9	010.6	335.4	000.1120	0180.6	046.6	40.06*	0.14
209.0	000.1500	0088.1	010.7	335.1	000.1130	0183.1	046.7	40.18*	0.45
210.0	000.1500	0091.6	010.9	334.8	000.1142	0186.1	046.7	40.35*	0.88
211.0	000.1500	0094.9	011.1	334.5	000.1155	0188.9	046.8	40.51*	1.29
212.0	000.1500	0094.3	011.1	334.4	000.1158	0189.8	046.9	40.49*	1.24
213.0	000.1500	0089.1	010.8	334.6	000.1151	0188.2	047.2	40.26*	0.67
214.0	000.1500	0082.0	010.4	334.9	000.1139	0185.4	047.6	39.94	
215.0	000.1500	0073.4	009.8	335.3	000.1123	0181.3	048.0	39.52	
216.0	000.1500	0064.3	009.2	335.8	000.1104	0176.4	048.5	39.05	
217.0	000.1500	0054.6	008.5	336.5	000.1079	0169.9	049.0	38.45	
218.0	000.1500	0046.8	007.8	337.1	000.1054	0163.5	049.5	37.84	
219.0	000.1500	0042.2	007.3	337.5	000.1041	0160.0	049.8	37.49	
220.0	000.1500	0040.1	007.1	337.6	000.1036	0158.8	050.0	37.33	
221.0	000.1500	0039.9	007.1	337.6	000.1038	0159.2	050.1	37.31	
222.0	000.1500	0038.5	007.0	337.7	000.1035	0158.5	050.3	37.20	
223.0	000.1500	0035.3	006.7	337.9	000.1026	0156.4	050.5	36.96	

**Exhibit 7a(2) - Proposed to Application Operations  
47 C.F.R. Section 74.1204(c) Existing Contour Overlap Request**

**W232CG.A**  
Brattleboro, VT  
BPFT20180420ABM  
Facility ID: 139889  
Latitude: 42-49-42.20 N  
Longitude: 072-36-00.30 W  
ERP: 0.15 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 368.0 m  
Pattern: Omni

**W232BW.A**  
Amherst, MA  
Proposed Operation  
Facility ID: 84372  
Latitude: 42-21-49 N  
Longitude: 072-25-24 W  
ERP: 0.25 kW  
Channel: 232D (94.3 MHz)  
AMSL Height: 404.0 m  
Horiz. Pattern: Directional

**36.54 km<sup>2</sup> of Given Overlap  
from W232CG.A to W232BW.A**

60 dBμ F(50:50)

**W232BW.A**

60 dBμ F(50:50)

40 dBμ F(50:10)

40 dBμ F(50:10)

Worcester

FCC 30 SEC Terrain Database  
US Census 2010 PL Database

Scale 1:575,000

0 8 16 24 km

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

V-Soft Communications LLC ©

# ***Exhibit 7a(2)***

## **Contour Protection Studies Toward Select Allocation Concern(s)**

06-29-2018

Terrain Data: FCC NGDC 30 Sec

FMOver Analysis

W232BW.P

W232CG BPFT20180420ABM

Channel = 232D  
Max ERP = 0.25 kW  
RCAMSL = 404 m  
N. Lat. 42 21 49.0  
W. Lng. 72 25 24.0  
Protected  
60 dBu

Channel = 232D  
Max ERP = 0.15 kW  
RCAMSL = 368 m  
N. Lat. 42 49 42.2  
W. Lng. 72 36 00.3  
Interfering  
40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
286.0	000.2500	0336.6	023.8	190.6	000.1500	0093.9	045.9	36.62	
287.0	000.2500	0336.2	023.8	190.5	000.1500	0094.6	045.5	36.84	
288.0	000.2500	0335.5	023.8	190.4	000.1500	0095.6	045.1	37.08	
289.0	000.2500	0334.8	023.8	190.3	000.1500	0096.7	044.7	37.33	
290.0	000.2500	0334.2	023.8	190.2	000.1500	0097.9	044.3	37.59	
291.0	000.2450	0333.7	023.6	189.9	000.1500	0100.9	043.9	37.99	
292.0	000.2401	0333.2	023.5	189.6	000.1500	0104.1	043.5	38.39	
293.0	000.2352	0332.7	023.4	189.4	000.1500	0107.3	043.1	38.78	
294.0	000.2304	0332.3	023.2	189.1	000.1500	0110.6	042.8	39.17	
295.0	000.2256	0332.0	023.1	188.7	000.1500	0113.9	042.4	39.55	
296.0	000.2209	0331.6	023.0	188.4	000.1500	0117.3	042.1	39.91	
297.0	000.2162	0331.1	022.9	188.1	000.1500	0120.7	041.7	40.26*	0.62
298.0	000.2116	0330.4	022.7	187.7	000.1500	0123.8	041.4	40.59*	1.36
299.0	000.2070	0329.6	022.6	187.3	000.1500	0125.9	041.1	40.84*	1.96
300.0	000.2025	0328.5	022.4	186.9	000.1500	0126.8	040.8	41.03*	2.38
301.0	000.1980	0327.1	022.2	186.5	000.1500	0127.2	040.5	41.18*	2.72
302.0	000.1936	0325.4	022.1	186.0	000.1500	0127.0	040.2	41.29*	2.97
303.0	000.1892	0323.5	021.9	185.6	000.1500	0125.8	040.0	41.34*	3.08
304.0	000.1849	0321.6	021.7	185.1	000.1500	0123.2	039.7	41.30*	2.98
305.0	000.1806	0319.4	021.5	184.5	000.1500	0120.1	039.5	41.22*	2.79
306.0	000.1764	0316.8	021.3	184.0	000.1500	0115.7	039.3	41.03*	2.38
307.0	000.1722	0313.4	021.1	183.4	000.1500	0110.5	039.1	40.75*	1.73
308.0	000.1681	0309.1	020.8	182.8	000.1500	0105.6	038.9	40.44*	1.01
309.0	000.1640	0303.7	020.5	182.1	000.1500	0103.0	038.8	40.28*	0.64
310.0	000.1600	0297.0	020.2	181.4	000.1500	0100.2	038.7	40.08*	0.18
311.0	000.1521	0289.2	019.6	180.5	000.1500	0096.8	038.8	39.75	
312.0	000.1444	0280.5	019.1	179.6	000.1500	0096.1	038.9	39.64	
313.0	000.1369	0271.4	018.5	178.6	000.1500	0098.6	039.1	39.80	
314.0	000.1296	0263.4	018.0	177.7	000.1500	0100.9	039.2	39.92	
315.0	000.1225	0256.3	017.5	176.9	000.1500	0101.9	039.4	39.93	
316.0	000.1156	0250.0	017.0	176.1	000.1500	0102.5	039.6	39.91	
317.0	000.1089	0244.1	016.5	175.3	000.1500	0103.6	039.8	39.92	
318.0	000.1024	0240.5	016.1	174.6	000.1500	0105.5	039.9	40.01*	0.02
319.0	000.0961	0239.3	015.8	174.0	000.1500	0107.8	040.0	40.14*	0.33



## Exhibit 7a(2)

### Contour Protection Studies Toward Select Allocation Concern(s)

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
320.0	000.0900	0238.7	015.5	173.5	000.1500	0111.0	040.1	40.34* 0.79
321.0	000.0856	0237.1	015.2	173.0	000.1500	0115.2	040.2	40.61* 1.41
322.0	000.0812	0234.3	014.9	172.4	000.1500	0120.4	040.3	40.89* 2.05
323.0	000.0770	0230.6	014.6	171.9	000.1500	0125.3	040.4	41.11* 2.55
324.0	000.0729	0226.5	014.3	171.4	000.1500	0129.5	040.6	41.27* 2.93
325.0	000.0689	0222.5	014.0	170.8	000.1500	0133.4	040.8	41.42* 3.26
326.0	000.0650	0220.2	013.7	170.4	000.1500	0136.6	040.9	41.54* 3.54
327.0	000.0613	0220.2	013.5	170.0	000.1500	0139.0	041.0	41.63* 3.76
328.0	000.0576	0222.1	013.4	169.6	000.1500	0141.1	041.0	41.73* 3.99
329.0	000.0541	0224.0	013.2	169.2	000.1500	0143.4	041.1	41.83* 4.22
330.0	000.0506	0223.1	013.0	168.8	000.1500	0146.1	041.2	41.92* 4.43
331.0	000.0506	0218.5	012.9	168.4	000.1500	0148.4	041.3	42.02* 4.67
332.0	000.0506	0210.8	012.6	168.1	000.1500	0150.4	041.4	42.05* 4.77
333.0	000.0506	0202.0	012.4	167.7	000.1500	0151.6	041.6	42.04* 4.74
334.0	000.0506	0193.1	012.1	167.3	000.1500	0152.3	041.8	41.98* 4.63
335.0	000.0506	0184.2	011.9	167.0	000.1500	0152.5	042.0	41.91* 4.46
336.0	000.0506	0174.7	011.6	166.6	000.1500	0152.3	042.2	41.78* 4.18
337.0	000.0506	0165.0	011.2	166.3	000.1500	0151.5	042.5	41.60* 3.77
338.0	000.0506	0155.5	010.9	165.9	000.1500	0150.4	042.9	41.41* 3.31
339.0	000.0506	0147.4	010.6	165.6	000.1500	0149.3	043.2	41.23* 2.90
340.0	000.0506	0142.9	010.4	165.4	000.1500	0148.6	043.3	41.12* 2.65
341.0	000.0541	0141.3	010.5	165.1	000.1500	0148.1	043.2	41.15* 2.71
342.0	000.0576	0140.5	010.6	164.9	000.1500	0147.5	043.0	41.18* 2.78
343.0	000.0613	0137.6	010.7	164.7	000.1500	0147.0	043.0	41.17* 2.75
344.0	000.0650	0132.8	010.6	164.4	000.1500	0146.4	043.0	41.12* 2.64
345.0	000.0689	0126.3	010.5	164.2	000.1500	0145.7	043.1	41.04* 2.44
346.0	000.0729	0119.2	010.4	163.9	000.1500	0145.1	043.3	40.94* 2.23
347.0	000.0770	0112.4	010.2	163.7	000.1500	0144.4	043.4	40.84* 1.99
348.0	000.0812	0109.4	010.2	163.5	000.1500	0143.7	043.4	40.80* 1.89
349.0	000.0856	0107.8	010.3	163.2	000.1500	0142.8	043.4	40.77* 1.81
350.0	000.0900	0105.1	010.3	163.0	000.1500	0141.8	043.4	40.71* 1.68
351.0	000.0961	0100.8	010.3	162.8	000.1500	0140.7	043.5	40.62* 1.46
352.0	000.1024	0097.0	010.2	162.5	000.1500	0139.3	043.5	40.52* 1.23
353.0	000.1089	0093.9	010.2	162.3	000.1500	0137.5	043.6	40.41* 0.97
354.0	000.1156	0090.8	010.2	162.1	000.1500	0135.7	043.6	40.29* 0.69
355.0	000.1225	0087.4	010.2	161.9	000.1500	0133.7	043.7	40.15* 0.35
356.0	000.1296	0084.0	010.1	161.6	000.1500	0131.7	043.8	40.00
357.0	000.1369	0080.0	010.0	161.5	000.1500	0129.8	044.0	39.83
358.0	000.1444	0075.8	009.9	161.3	000.1500	0128.0	044.1	39.67
359.0	000.1521	0071.7	009.8	161.1	000.1500	0126.3	044.3	39.50
000.0	000.1600	0070.5	009.8	160.9	000.1500	0124.0	044.3	39.37
001.0	000.1600	0070.0	009.8	160.7	000.1500	0121.9	044.4	39.22
002.0	000.1600	0069.5	009.7	160.5	000.1500	0119.9	044.5	39.07
003.0	000.1600	0068.8	009.7	160.3	000.1500	0118.0	044.6	38.91
004.0	000.1600	0068.7	009.7	160.1	000.1500	0116.0	044.7	38.75
005.0	000.1600	0069.9	009.8	159.9	000.1500	0113.6	044.7	38.61
006.0	000.1600	0073.0	010.0	159.6	000.1500	0111.0	044.6	38.47
007.0	000.1600	0077.7	010.3	159.2	000.1500	0108.2	044.4	38.35
008.0	000.1600	0084.3	010.7	158.8	000.1500	0105.8	044.1	38.29
009.0	000.1600	0092.3	011.1	158.2	000.1500	0104.6	043.8	38.32
010.0	000.1600	0098.7	011.5	157.8	000.1500	0104.7	043.6	38.40

## ***Exhibit 7a(2)***

### **Contour Protection Studies Toward Select Allocation Concern(s)**

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)		Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
011.0	000.1600	0103.2	011.7		157.4	000.1500	0105.7	043.5	38.52
012.0	000.1600	0106.0	011.9		157.0	000.1500	0107.0	043.5	38.62
013.0	000.1600	0110.0	012.1		156.7	000.1500	0109.1	043.4	38.80
014.0	000.1600	0115.6	012.4		156.2	000.1500	0112.0	043.3	39.04
015.0	000.1600	0119.1	012.5		155.8	000.1500	0114.3	043.3	39.20
016.0	000.1600	0120.4	012.6		155.6	000.1500	0116.0	043.4	39.26
017.0	000.1600	0120.1	012.6		155.4	000.1500	0117.2	043.6	39.27
018.0	000.1600	0121.7	012.7		155.1	000.1500	0118.6	043.7	39.32
019.0	000.1600	0126.3	012.9		154.7	000.1500	0120.2	043.7	39.42
020.0	000.1600	0132.4	013.2		154.2	000.1500	0121.3	043.6	39.51
021.0	000.1600	0137.4	013.5		153.7	000.1500	0121.9	043.6	39.54
022.0	000.1600	0140.6	013.6		153.3	000.1500	0122.1	043.7	39.53
023.0	000.1600	0143.4	013.8		153.0	000.1500	0122.5	043.7	39.51
024.0	000.1600	0147.3	014.0		152.6	000.1500	0122.9	043.8	39.52
025.0	000.1600	0151.2	014.2		152.2	000.1500	0124.0	043.9	39.55
026.0	000.1600	0152.3	014.2		151.9	000.1500	0124.8	044.0	39.52
027.0	000.1600	0150.5	014.1		151.8	000.1500	0125.2	044.3	39.44
028.0	000.1600	0149.1	014.1		151.7	000.1500	0125.6	044.5	39.36
029.0	000.1600	0149.8	014.1		151.5	000.1500	0126.7	044.7	39.34
030.0	000.1600	0151.2	014.2		151.3	000.1500	0128.2	044.9	39.35
031.0	000.1600	0152.2	014.2		151.0	000.1500	0129.6	045.1	39.35
032.0	000.1600	0152.8	014.3		150.9	000.1500	0130.8	045.3	39.34
033.0	000.1600	0154.1	014.3		150.6	000.1500	0132.5	045.5	39.35
034.0	000.1600	0157.7	014.5		150.3	000.1500	0135.2	045.6	39.44
035.0	000.1600	0163.0	014.8		149.8	000.1500	0139.3	045.7	39.61
036.0	000.1600	0167.8	015.0		149.4	000.1500	0143.4	045.9	39.77
037.0	000.1600	0171.1	015.2		149.1	000.1500	0146.9	046.0	39.88
038.0	000.1600	0172.5	015.3		148.9	000.1500	0149.3	046.3	39.91
039.0	000.1600	0172.3	015.3		148.8	000.1500	0150.6	046.5	39.88
040.0	000.1600	0171.3	015.2		148.7	000.1500	0151.2	046.8	39.80
041.0	000.1600	0170.8	015.2		148.7	000.1500	0152.1	047.0	39.74
042.0	000.1600	0171.2	015.2		148.5	000.1500	0153.6	047.3	39.72
043.0	000.1600	0172.5	015.3		148.4	000.1500	0155.7	047.5	39.73

## Exhibit 7a(2)

### Contour Protection Studies Toward Select Allocation Concern(s)

06-29-2018

Terrain Data: FCC NGDC 30 Sec

FMOver Analysis

W232CG BPFT20180420ABM

W232BW.P

Channel = 232D

Max ERP = 0.15 kW

RCAMSL = 368 m

N. Lat. 42 49 42.2

W. Lng. 72 36 00.3

Protected

60 dBu

Channel = 232D

Max ERP = 0.25 kW

RCAMSL = 404 m

N. Lat. 42 21 49.0

W. Lng. 72 25 24.0

Interfering

40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
104.0	000.1500	0195.9	016.0	001.3	000.1600	0069.8	047.8	34.00	
105.0	000.1500	0202.5	016.3	001.6	000.1600	0069.7	047.5	34.10	
106.0	000.1500	0209.5	016.6	001.8	000.1600	0069.6	047.1	34.20	
107.0	000.1500	0217.6	016.9	002.1	000.1600	0069.3	046.7	34.30	
108.0	000.1500	0225.4	017.2	002.4	000.1600	0068.9	046.4	34.39	
109.0	000.1500	0233.1	017.5	002.7	000.1600	0068.8	046.0	34.50	
110.0	000.1500	0239.5	017.8	002.9	000.1600	0068.8	045.6	34.63	
111.0	000.1500	0242.4	017.9	002.9	000.1600	0068.8	045.3	34.75	
112.0	000.1500	0241.8	017.9	002.7	000.1600	0068.8	045.0	34.84	
113.0	000.1500	0237.8	017.7	002.4	000.1600	0069.0	044.8	34.95	
114.0	000.1500	0232.8	017.5	002.0	000.1600	0069.5	044.6	35.08	
115.0	000.1500	0228.3	017.3	001.7	000.1600	0069.7	044.3	35.18	
116.0	000.1500	0224.2	017.2	001.3	000.1600	0069.8	044.1	35.27	
117.0	000.1500	0219.9	017.0	000.9	000.1600	0070.0	043.9	35.36	
118.0	000.1500	0216.8	016.9	000.6	000.1600	0070.2	043.7	35.45	
119.0	000.1500	0215.8	016.8	000.4	000.1600	0070.3	043.5	35.55	
120.0	000.1500	0218.2	016.9	000.3	000.1600	0070.3	043.2	35.67	
121.0	000.1500	0223.2	017.1	000.4	000.1600	0070.3	042.8	35.80	
122.0	000.1500	0230.2	017.4	000.5	000.1600	0070.2	042.4	35.94	
123.0	000.1500	0238.1	017.7	000.6	000.1600	0070.2	042.0	36.10	
124.0	000.1500	0245.9	018.0	000.7	000.1600	0070.1	041.6	36.25	
125.0	000.1500	0252.9	018.3	000.8	000.1600	0070.1	041.2	36.41	
126.0	000.1500	0258.4	018.5	000.7	000.1600	0070.1	040.8	36.55	
127.0	000.1500	0262.2	018.6	000.6	000.1600	0070.2	040.4	36.69	
128.0	000.1500	0264.3	018.7	000.4	000.1600	0070.3	040.1	36.82	
129.0	000.1500	0265.0	018.7	000.2	000.1600	0070.4	039.9	36.94	
130.0	000.1500	0265.1	018.7	359.9	000.1590	0070.5	039.6	37.03	
131.0	000.1500	0264.6	018.7	359.5	000.1564	0070.7	039.4	37.07	
132.0	000.1500	0263.3	018.7	359.2	000.1535	0071.2	039.2	37.13	
133.0	000.1500	0261.0	018.6	358.8	000.1502	0072.6	039.0	37.26	
134.0	000.1500	0257.8	018.5	358.3	000.1467	0074.5	038.8	37.43	
135.0	000.1500	0254.2	018.3	357.8	000.1431	0076.5	038.7	37.59	
136.0	000.1500	0250.8	018.2	357.3	000.1395	0078.5	038.6	37.74	

***Exhibit 7a(2)***  
***Contour Protection Studies Toward Select Allocation Concern(s)***

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
137.0	000.1500	0247.4	018.1	356.9	000.1359	0080.5	038.5	37.88
138.0	000.1500	0243.4	017.9	356.4	000.1322	0082.6	038.4	38.01
139.0	000.1500	0239.3	017.8	355.8	000.1285	0084.5	038.3	38.11
140.0	000.1500	0235.0	017.6	355.3	000.1248	0086.3	038.3	38.18
141.0	000.1500	0229.8	017.4	354.8	000.1209	0088.2	038.3	38.23
142.0	000.1500	0223.9	017.2	354.2	000.1170	0090.1	038.3	38.26
143.0	000.1500	0217.1	016.9	353.6	000.1130	0092.0	038.4	38.25
144.0	000.1500	0209.3	016.6	353.0	000.1089	0093.9	038.6	38.20
145.0	000.1500	0199.6	016.2	352.3	000.1046	0095.9	038.8	38.12
146.0	000.1500	0188.1	015.7	351.7	000.1002	0098.1	039.1	37.99
147.0	000.1500	0174.8	015.1	351.0	000.0958	0101.0	039.5	37.87
148.0	000.1500	0160.9	014.4	350.2	000.0914	0104.2	040.0	37.71
149.0	000.1500	0148.0	013.8	349.6	000.0881	0106.6	040.5	37.51
150.0	000.1500	0137.6	013.3	349.0	000.0856	0107.7	041.0	37.30
151.0	000.1500	0129.9	012.9	348.5	000.0835	0108.4	041.2	37.11
152.0	000.1500	0124.4	012.6	348.1	000.0818	0109.1	041.4	36.99
153.0	000.1500	0122.4	012.5	347.8	000.0804	0109.9	041.5	36.96
154.0	000.1500	0121.6	012.5	347.5	000.0791	0110.7	041.5	36.96
155.0	000.1500	0118.9	012.3	347.2	000.0777	0111.7	041.5	36.92
156.0	000.1500	0113.3	012.1	346.8	000.0762	0113.4	041.8	36.85
157.0	000.1500	0107.2	011.8	346.5	000.0748	0115.7	042.0	36.81
158.0	000.1500	0104.4	011.6	346.2	000.0735	0118.0	042.1	36.84
159.0	000.1500	0107.0	011.7	345.9	000.0725	0120.0	042.0	36.96
160.0	000.1500	0114.6	012.1	345.7	000.0716	0121.6	041.6	37.18
161.0	000.1500	0125.1	012.6	345.4	000.0706	0123.3	041.1	37.44
162.0	000.1500	0135.1	013.1	345.2	000.0696	0125.2	040.6	37.70
163.0	000.1500	0141.9	013.5	344.9	000.0683	0127.3	040.2	37.91
164.0	000.1500	0145.3	013.6	344.5	000.0670	0129.6	040.0	38.04
165.0	000.1500	0147.8	013.8	344.2	000.0657	0131.8	039.9	38.13
166.0	000.1500	0150.6	013.9	343.8	000.0644	0133.8	039.7	38.22
167.0	000.1500	0152.5	014.0	343.5	000.0630	0135.5	039.7	38.27
168.0	000.1500	0150.6	013.9	343.1	000.0617	0137.0	039.8	38.21
169.0	000.1500	0144.7	013.6	342.8	000.0606	0138.2	040.1	38.05
170.0	000.1500	0138.8	013.3	342.5	000.0596	0139.1	040.4	37.87
171.0	000.1500	0132.2	013.0	342.3	000.0587	0139.9	040.8	37.68
172.0	000.1500	0124.3	012.6	342.1	000.0579	0140.4	041.2	37.47
173.0	000.1500	0114.9	012.1	341.9	000.0572	0140.7	041.7	37.22
174.0	000.1500	0108.0	011.8	341.7	000.0566	0140.9	042.1	37.01
175.0	000.1500	0104.3	011.6	341.5	000.0558	0141.1	042.3	36.86
176.0	000.1500	0102.5	011.5	341.3	000.0550	0141.2	042.5	36.74
177.0	000.1500	0101.7	011.5	341.0	000.0541	0141.3	042.6	36.64
178.0	000.1500	0100.2	011.4	340.8	000.0534	0141.5	042.7	36.52
179.0	000.1500	0097.6	011.2	340.6	000.0527	0141.7	042.9	36.40
180.0	000.1500	0094.9	011.1	340.4	000.0521	0142.0	043.1	36.27
181.0	000.1500	0098.7	011.3	340.1	000.0509	0142.7	043.0	36.26
182.0	000.1500	0102.5	011.5	339.7	000.0506	0143.6	042.8	36.34
183.0	000.1500	0106.9	011.7	339.4	000.0506	0145.2	042.7	36.49
184.0	000.1500	0115.6	012.2	338.9	000.0506	0148.4	042.4	36.79
185.0	000.1500	0122.8	012.5	338.4	000.0506	0152.0	042.2	37.08
186.0	000.1500	0127.0	012.7	338.0	000.0506	0155.4	042.1	37.29
187.0	000.1500	0126.7	012.7	337.8	000.0506	0157.7	042.2	37.36

## ***Exhibit 7a(2)***

### **Contour Protection Studies Toward Select Allocation Concern(s)**

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
188.0	000.1500	0121.4	012.5	337.7	000.0506	0158.5	042.6	37.25
189.0	000.1500	0111.1	012.0	337.8	000.0506	0157.6	043.1	36.96
190.0	000.1500	0100.0	011.4	337.9	000.0506	0156.0	043.7	36.62
191.0	000.1500	0089.2	010.8	338.1	000.0506	0154.2	044.3	36.26
192.0	000.1500	0078.8	010.2	338.4	000.0506	0152.2	044.9	35.90
193.0	000.1500	0071.2	009.7	338.5	000.0506	0150.8	045.4	35.63
194.0	000.1500	0066.8	009.4	338.6	000.0506	0150.6	045.7	35.47
195.0	000.1500	0065.4	009.3	338.5	000.0506	0151.3	045.9	35.44
196.0	000.1500	0066.3	009.4	338.3	000.0506	0153.0	046.0	35.51
197.0	000.1500	0068.7	009.5	338.0	000.0506	0155.5	045.9	35.64
198.0	000.1500	0070.4	009.6	337.7	000.0506	0157.8	046.0	35.75
199.0	000.1500	0072.3	009.8	337.5	000.0506	0160.3	046.0	35.87
200.0	000.1500	0077.0	010.1	337.1	000.0506	0164.2	045.9	36.11
201.0	000.1500	0083.2	010.4	336.6	000.0506	0169.0	045.7	36.41
202.0	000.1500	0088.8	010.8	336.1	000.0506	0173.4	045.6	36.66
203.0	000.1500	0093.6	011.0	335.7	000.0506	0177.4	045.6	36.87
204.0	000.1500	0095.5	011.1	335.5	000.0506	0180.0	045.7	36.96
205.0	000.1500	0092.2	010.9	335.5	000.0506	0179.8	045.9	36.84
206.0	000.1500	0086.9	010.6	335.6	000.0506	0178.4	046.3	36.64
207.0	000.1500	0084.6	010.5	335.6	000.0506	0178.6	046.5	36.55
208.0	000.1500	0085.9	010.6	335.4	000.0506	0180.6	046.6	36.61
209.0	000.1500	0088.1	010.7	335.1	000.0506	0183.1	046.7	36.69
210.0	000.1500	0091.6	010.9	334.8	000.0506	0186.1	046.7	36.82
211.0	000.1500	0094.9	011.1	334.5	000.0506	0188.9	046.8	36.93
212.0	000.1500	0094.3	011.1	334.4	000.0506	0189.8	046.9	36.90
213.0	000.1500	0089.1	010.8	334.6	000.0506	0188.2	047.2	36.70
214.0	000.1500	0082.0	010.4	334.9	000.0506	0185.4	047.6	36.42
215.0	000.1500	0073.4	009.8	335.3	000.0506	0181.3	048.0	36.07
216.0	000.1500	0064.3	009.2	335.8	000.0506	0176.4	048.5	35.66
217.0	000.1500	0054.6	008.5	336.5	000.0506	0169.9	049.0	35.16
218.0	000.1500	0046.8	007.8	337.1	000.0506	0163.5	049.5	34.66
219.0	000.1500	0042.2	007.3	337.5	000.0506	0160.0	049.8	34.36
220.0	000.1500	0040.1	007.1	337.6	000.0506	0158.8	050.0	34.22
221.0	000.1500	0039.9	007.1	337.6	000.0506	0159.2	050.1	34.19
222.0	000.1500	0038.5	007.0	337.7	000.0506	0158.5	050.3	34.10
223.0	000.1500	0035.3	006.7	337.9	000.0506	0156.4	050.5	33.89

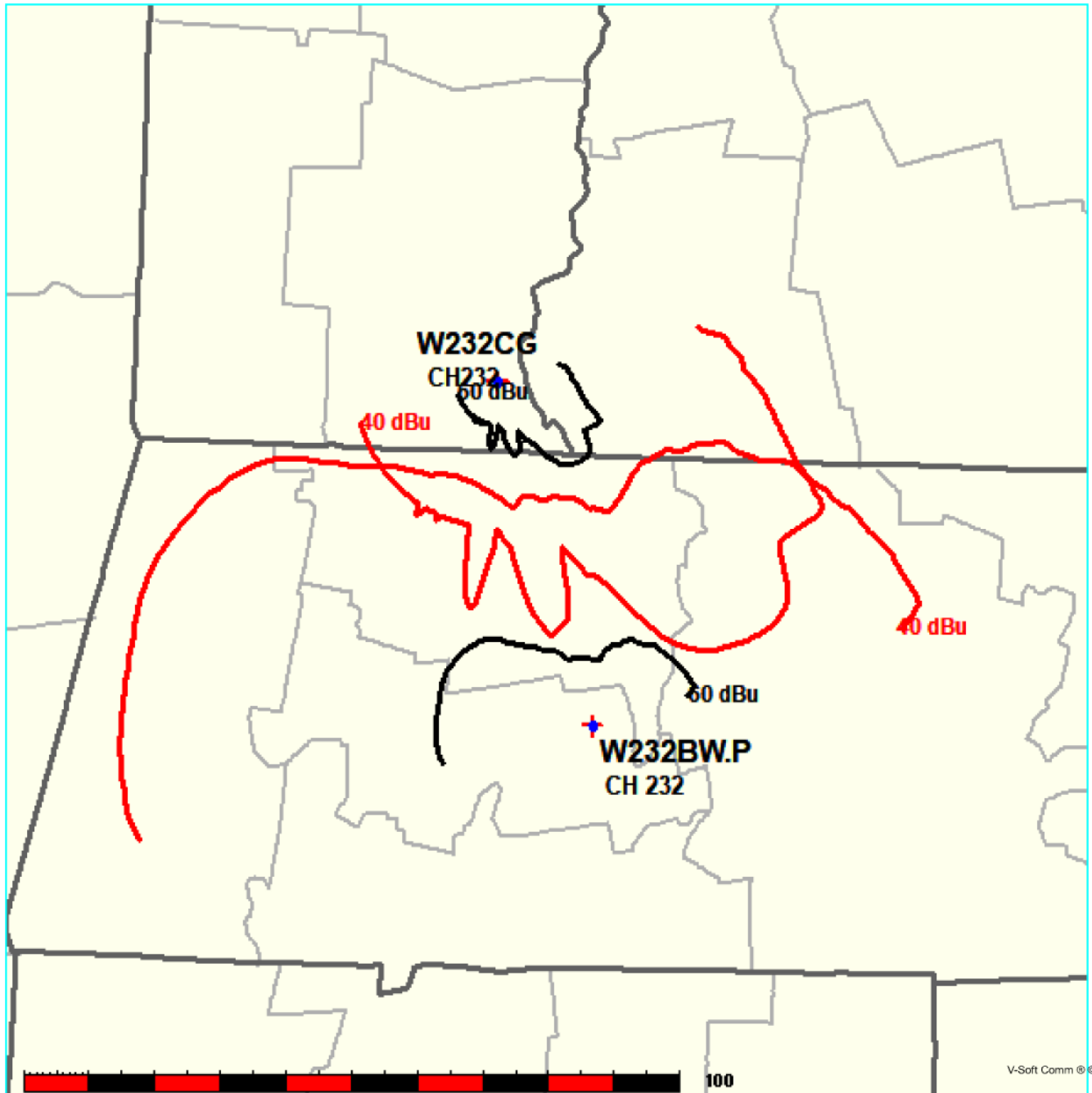
***Exhibit 7b***  
**Contour Protection Studies Toward Select Allocation Concern(s)**

Saga Communications Of New England, Llc

FMCommander Single Allocation Study - 06-29-2018 - FCC NGDC 30 Sec  
W232BW.P's Overlaps (In= 5.45 km, Out= 6.87 km)

W232BW.P CH 232 D DA  
Lat= 42 21 49.0, Lng= 72 25 24.0  
0.25 kW 230 m HAAT, 404 m COR  
Prot.= 60 dBu, Intef.= 40 dBu

W232CG CH 232 D BLFT20121113ABM  
Lat= 42 49 44.0, Lng= 72 35 52.0  
0.19 kW 31.2 m HAAT, 307 m COR  
Prot.= 60 dBu, Intef.= 40 dBu



# ***Exhibit 7b***

## **Contour Protection Studies Toward Select Allocation Concern(s)**

06-29-2018

Terrain Data: FCC NGDC 30 Sec

FMOver Analysis

W232BW.P

W232CG BLFT20121113ABM

Channel = 232D

Max ERP = 0.25 kW

RCAMSL = 404 m

N. Lat. 42 21 49.0

W. Lng. 72 25 24.0

Protected

60 dBu

Channel = 232D

Max ERP = 0.19 kW

RCAMSL = 307 m

N. Lat. 42 49 44.0

W. Lng. 72 35 52.0

Interfering

40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
303.0	000.1892	0323.5	021.9	185.8	000.1900	0064.9	040.0	37.01	
304.0	000.1849	0321.6	021.7	185.3	000.1900	0060.7	039.8	36.62	
305.0	000.1806	0319.4	021.5	184.8	000.1900	0055.9	039.5	36.11	
306.0	000.1764	0316.8	021.3	184.3	000.1900	0051.2	039.3	35.49	
307.0	000.1722	0313.4	021.1	183.7	000.1900	0046.4	039.1	34.76	
308.0	000.1681	0309.1	020.8	183.1	000.1900	0043.5	039.0	34.31	
309.0	000.1640	0303.7	020.5	182.4	000.1900	0040.7	038.9	33.82	
310.0	000.1600	0297.0	020.2	181.7	000.1900	0036.5	038.8	33.04	
311.0	000.1521	0289.2	019.6	180.8	000.1900	0030.3	038.9	31.75	
312.0	000.1444	0280.5	019.1	179.8	000.1900	0032.2	039.0	32.10	
313.0	000.1369	0271.4	018.5	178.9	000.1900	0034.4	039.1	32.51	
314.0	000.1296	0263.4	018.0	178.0	000.1900	0036.1	039.3	32.79	
315.0	000.1225	0256.3	017.5	177.2	000.1900	0036.8	039.4	32.89	
316.0	000.1156	0250.0	017.0	176.4	000.1900	0038.2	039.6	33.10	
317.0	000.1089	0244.1	016.5	175.6	000.1900	0042.4	039.8	33.81	
318.0	000.1024	0240.5	016.1	174.9	000.1900	0047.3	039.9	34.62	
319.0	000.0961	0239.3	015.8	174.3	000.1900	0051.7	040.0	35.30	
320.0	000.0900	0238.7	015.5	173.8	000.1900	0056.9	040.1	36.01	
321.0	000.0856	0237.1	015.2	173.2	000.1900	0061.5	040.2	36.57	
322.0	000.0812	0234.3	014.9	172.7	000.1900	0066.2	040.3	37.05	
323.0	000.0770	0230.6	014.6	172.2	000.1900	0070.4	040.4	37.47	
324.0	000.0729	0226.5	014.3	171.6	000.1900	0074.3	040.6	37.82	
325.0	000.0689	0222.5	014.0	171.1	000.1900	0077.1	040.8	38.05	
326.0	000.0650	0220.2	013.7	170.7	000.1900	0078.8	040.9	38.18	
327.0	000.0613	0220.2	013.5	170.2	000.1900	0080.5	041.0	38.31	
328.0	000.0576	0222.1	013.4	169.9	000.1900	0082.4	041.0	38.49	
329.0	000.0541	0224.0	013.2	169.5	000.1900	0084.8	041.1	38.70	
330.0	000.0506	0223.1	013.0	169.1	000.1900	0087.0	041.2	38.86	
331.0	000.0506	0218.5	012.9	168.7	000.1900	0088.3	041.3	38.97	
332.0	000.0506	0210.8	012.6	168.3	000.1900	0089.2	041.4	38.99	
333.0	000.0506	0202.0	012.4	168.0	000.1900	0089.6	041.6	38.95	
334.0	000.0506	0193.1	012.1	167.6	000.1900	0089.5	041.8	38.87	
335.0	000.0506	0184.2	011.9	167.2	000.1900	0089.0	042.0	38.74	

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

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)		Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
336.0	000.0506	0174.7	011.6		166.9	000.1900	0088.1	042.3	38.55
337.0	000.0506	0165.0	011.2		166.5	000.1900	0087.1	042.6	38.34
338.0	000.0506	0155.5	010.9		166.2	000.1900	0086.3	042.9	38.14
339.0	000.0506	0147.4	010.6		165.9	000.1900	0085.9	043.2	37.99
340.0	000.0506	0142.9	010.4		165.6	000.1900	0085.5	043.3	37.89
341.0	000.0541	0141.3	010.5		165.4	000.1900	0085.2	043.2	37.91
342.0	000.0576	0140.5	010.6		165.2	000.1900	0084.8	043.0	37.93
343.0	000.0613	0137.6	010.7		164.9	000.1900	0084.3	043.0	37.90
344.0	000.0650	0132.8	010.6		164.7	000.1900	0083.8	043.0	37.84
345.0	000.0689	0126.3	010.5		164.4	000.1900	0083.3	043.1	37.74
346.0	000.0729	0119.2	010.4		164.2	000.1900	0082.6	043.3	37.63
347.0	000.0770	0112.4	010.2		164.0	000.1900	0081.8	043.4	37.49
348.0	000.0812	0109.4	010.2		163.7	000.1900	0080.8	043.4	37.39
349.0	000.0856	0107.8	010.3		163.5	000.1900	0079.7	043.4	37.29
350.0	000.0900	0105.1	010.3		163.2	000.1900	0078.2	043.4	37.14
351.0	000.0961	0100.8	010.3		163.0	000.1900	0076.4	043.5	36.94
352.0	000.1024	0097.0	010.2		162.8	000.1900	0074.5	043.5	36.72
353.0	000.1089	0093.9	010.2		162.6	000.1900	0072.3	043.6	36.48
354.0	000.1156	0090.8	010.2		162.3	000.1900	0070.0	043.6	36.22
355.0	000.1225	0087.4	010.2		162.1	000.1900	0067.8	043.7	35.95
356.0	000.1296	0084.0	010.1		161.9	000.1900	0065.5	043.8	35.67
357.0	000.1369	0080.0	010.0		161.7	000.1900	0063.5	043.9	35.41
358.0	000.1444	0075.8	009.9		161.5	000.1900	0061.6	044.1	35.14
359.0	000.1521	0071.7	009.8		161.4	000.1900	0059.8	044.3	34.88
000.0	000.1600	0070.5	009.8		161.2	000.1900	0057.4	044.3	34.59
001.0	000.1600	0070.0	009.8		161.0	000.1900	0055.3	044.4	34.30
002.0	000.1600	0069.5	009.7		160.8	000.1900	0053.4	044.5	34.01
003.0	000.1600	0068.8	009.7		160.6	000.1900	0051.7	044.6	33.73
004.0	000.1600	0068.7	009.7		160.4	000.1900	0050.1	044.6	33.47
005.0	000.1600	0069.9	009.8		160.1	000.1900	0048.2	044.6	33.19
006.0	000.1600	0073.0	010.0		159.8	000.1900	0046.4	044.5	32.93
007.0	000.1600	0077.7	010.3		159.5	000.1900	0044.8	044.4	32.74
008.0	000.1600	0084.3	010.7		159.0	000.1900	0044.1	044.1	32.70
009.0	000.1600	0092.3	011.1		158.5	000.1900	0044.5	043.8	32.87
010.0	000.1600	0098.7	011.5		158.0	000.1900	0046.2	043.6	33.21
011.0	000.1600	0103.2	011.7		157.6	000.1900	0048.3	043.5	33.58
012.0	000.1600	0106.0	011.9		157.3	000.1900	0050.3	043.5	33.90
013.0	000.1600	0110.0	012.1		156.9	000.1900	0052.9	043.4	34.30
014.0	000.1600	0115.6	012.4		156.5	000.1900	0056.0	043.3	34.75
015.0	000.1600	0119.1	012.5		156.1	000.1900	0058.2	043.3	35.04
016.0	000.1600	0120.4	012.6		155.8	000.1900	0059.7	043.4	35.18
017.0	000.1600	0120.1	012.6		155.6	000.1900	0060.7	043.6	35.24
018.0	000.1600	0121.7	012.7		155.3	000.1900	0061.7	043.6	35.32
019.0	000.1600	0126.3	012.9		154.9	000.1900	0062.8	043.6	35.44
020.0	000.1600	0132.4	013.2		154.4	000.1900	0063.4	043.6	35.53



# ***Exhibit 7b***

## **Contour Protection Studies Toward Select Allocation Concern(s)**

06-29-2018

Terrain Data: FCC NGDC 30 Sec

FMOver Analysis

W232CG BLFT20121113ABM

W232BW.P

Channel = 232D  
Max ERP = 0.19 kW  
RCAMSL = 307 m  
N. Lat. 42 49 44.0  
W. Lng. 72 35 52.0  
Protected  
60 dBu

Channel = 232D  
Max ERP = 0.25 kW  
RCAMSL = 404 m  
N. Lat. 42 21 49.0  
W. Lng. 72 25 24.0  
Interfering  
40 dBu

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)	IX (km)
122.0	000.1900	0164.7	015.6	358.6	000.1493	0073.0	043.5	35.55	
123.0	000.1900	0172.4	016.0	358.9	000.1513	0072.1	043.0	35.68	
124.0	000.1900	0180.4	016.4	359.1	000.1530	0071.4	042.6	35.82	
125.0	000.1900	0188.1	016.7	359.3	000.1542	0071.0	042.1	35.98	
126.0	000.1900	0194.9	017.0	359.4	000.1549	0070.8	041.7	36.14	
127.0	000.1900	0200.0	017.3	359.4	000.1549	0070.8	041.3	36.28	
128.0	000.1900	0203.3	017.4	359.2	000.1541	0071.0	041.0	36.41	
129.0	000.1900	0205.0	017.5	359.1	000.1525	0071.5	040.7	36.52	
130.0	000.1900	0205.6	017.5	358.8	000.1506	0072.4	040.5	36.66	
131.0	000.1900	0205.3	017.5	358.5	000.1482	0073.6	040.3	36.81	
132.0	000.1900	0204.5	017.4	358.2	000.1457	0075.1	040.1	36.97	
133.0	000.1900	0202.9	017.4	357.8	000.1428	0076.7	039.9	37.12	
134.0	000.1900	0200.3	017.3	357.4	000.1396	0078.5	039.8	37.26	
135.0	000.1900	0197.1	017.1	356.9	000.1362	0080.4	039.7	37.39	
136.0	000.1900	0193.8	017.0	356.4	000.1328	0082.3	039.6	37.51	
137.0	000.1900	0190.6	016.8	356.0	000.1295	0084.0	039.5	37.61	
138.0	000.1900	0187.3	016.7	355.5	000.1262	0085.6	039.4	37.69	
139.0	000.1900	0183.5	016.5	355.0	000.1228	0087.3	039.4	37.74	
140.0	000.1900	0179.7	016.4	354.6	000.1194	0089.0	039.4	37.80	
141.0	000.1900	0175.5	016.1	354.0	000.1159	0090.7	039.4	37.82	
142.0	000.1900	0170.5	015.9	353.5	000.1122	0092.4	039.5	37.81	
143.0	000.1900	0164.8	015.6	352.9	000.1084	0094.1	039.6	37.77	
144.0	000.1900	0158.1	015.2	352.3	000.1045	0095.9	039.8	37.69	
145.0	000.1900	0150.1	014.8	351.7	000.1005	0098.0	040.1	37.58	
146.0	000.1900	0140.3	014.2	351.0	000.0963	0100.6	040.4	37.46	
147.0	000.1900	0128.0	013.5	350.3	000.0920	0103.8	041.0	37.30	
148.0	000.1900	0114.6	012.8	349.7	000.0885	0106.3	041.5	37.10	
149.0	000.1900	0100.6	012.1	349.0	000.0857	0107.7	042.2	36.79	
150.0	000.1900	0088.0	011.3	348.4	000.0831	0108.5	042.8	36.46	
151.0	000.1900	0078.1	010.7	347.9	000.0810	0109.5	043.3	36.20	
152.0	000.1900	0070.4	010.2	347.5	000.0792	0110.6	043.7	36.00	

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

Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Azimuth (degrees)	ERP (kW)	HAAT (m)	Dist (km)	Actual (dBu)
153.0	000.1900	0065.6	009.9	347.2	000.0778	0111.6	044.0	35.88
154.0	000.1900	0063.8	009.8	346.9	000.0768	0112.6	044.1	35.86
155.0	000.1900	0062.6	009.7	346.7	000.0758	0114.0	044.1	35.88
156.0	000.1900	0058.8	009.4	346.4	000.0746	0116.0	044.4	35.84
157.0	000.1900	0052.3	008.8	346.1	000.0733	0118.4	044.9	35.69
158.0	000.1900	0046.3	008.2	345.8	000.0721	0120.7	045.5	35.52
159.0	000.1900	0044.1	008.0	345.6	000.0713	0122.2	045.7	35.46
160.0	000.1900	0047.3	008.3	345.5	000.0707	0123.2	045.4	35.63
161.0	000.1900	0055.8	009.2	345.4	000.0703	0123.9	044.5	35.98
162.0	000.1900	0066.5	010.0	345.2	000.0697	0124.9	043.7	36.33
163.0	000.1900	0076.3	010.6	345.0	000.0689	0126.3	043.1	36.64
164.0	000.1900	0081.9	011.0	344.8	000.0680	0128.0	042.7	36.83
165.0	000.1900	0084.5	011.1	344.5	000.0670	0129.7	042.5	36.93
166.0	000.1900	0086.0	011.2	344.2	000.0659	0131.4	042.5	36.99
167.0	000.1900	0088.4	011.4	344.0	000.0649	0133.1	042.3	37.07
168.0	000.1900	0089.5	011.4	343.7	000.0638	0134.5	042.3	37.10
169.0	000.1900	0087.3	011.3	343.4	000.0629	0135.7	042.4	37.04
170.0	000.1900	0081.6	010.9	343.2	000.0621	0136.6	042.8	36.87
171.0	000.1900	0077.6	010.7	343.0	000.0613	0137.5	043.1	36.75
172.0	000.1900	0071.6	010.3	342.9	000.0607	0138.1	043.5	36.56
173.0	000.1900	0063.7	009.8	342.8	000.0604	0138.4	044.0	36.31
174.0	000.1900	0054.5	009.0	342.7	000.0602	0138.6	044.8	36.00
175.0	000.1900	0046.6	008.3	342.7	000.0603	0138.5	045.6	35.67
176.0	000.1900	0039.7	007.5	342.8	000.0604	0138.4	046.3	35.38
177.0	000.1900	0037.0	007.3	342.7	000.0601	0138.7	046.6	35.26
178.0	000.1900	0036.1	007.2	342.6	000.0597	0139.1	046.7	35.20
179.0	000.1900	0034.2	007.0	342.5	000.0594	0139.3	046.9	35.10
180.0	000.1900	0031.8	006.8	342.4	000.0591	0139.5	047.2	35.00
181.0	000.1900	0031.1	006.7	342.3	000.0587	0139.8	047.3	34.94
182.0	000.1900	0038.6	007.4	341.9	000.0572	0140.7	046.6	35.13
183.0	000.1900	0043.2	007.9	341.5	000.0559	0141.1	046.2	35.21
184.0	000.1900	0048.7	008.5	341.1	000.0543	0141.3	045.8	35.29
185.0	000.1900	0057.7	009.3	340.5	000.0523	0141.9	045.1	35.44
186.0	000.1900	0066.4	009.9	339.9	000.0506	0143.0	044.6	35.57
187.0	000.1900	0070.6	010.2	339.6	000.0506	0144.2	044.4	35.71
188.0	000.1900	0070.1	010.2	339.4	000.0506	0145.1	044.5	35.71
189.0	000.1900	0063.6	009.8	339.5	000.0506	0144.7	045.0	35.49
190.0	000.1900	0052.9	008.9	339.8	000.0506	0143.3	045.8	35.07
191.0	000.1900	0040.9	007.7	340.4	000.0521	0141.9	046.9	34.67
192.0	000.1900	0029.7	006.6	341.0	000.0540	0141.3	047.9	34.41
193.0	000.1900	0019.4	006.6	340.9	000.0535	0141.4	048.0	34.35
194.0	000.1900	0013.2	006.6	340.7	000.0531	0141.6	048.0	34.30
195.0	000.1900	0009.5	006.6	340.6	000.0528	0141.7	048.1	34.25
196.0	000.1900	0008.0	006.6	340.5	000.0524	0141.8	048.1	34.20
197.0	000.1900	0008.0	006.6	340.4	000.0520	0142.0	048.2	34.15

Signal Report

WMAS-FM Signal value at Reference site = 61.1 dBu. Distance to W232BW.P interference signal contour = 979.9 m

OK

Signal Report

WRSI Signal value at Reference site = 62.8 dBu. Distance to W232BW.P interference signal contour = 801.9 m

OK

## 101.1 dBμ F(50:10) Interference Contour

### ***Exhibit 8*** ***47 C.F.R. Section 74.1204(d)*** ***2nd/3rd Adjacent Channel*** ***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 WMAS-FM - Enfield, CT (CH234B) and WRSI(FM) - Turners Falls, MA (CH230A). The Interference Contour at the proposed Translator site has been calculated to be no less than the 101.1 dBμ F(50:10) interference contour corresponding to the worst case protected contour at the Translator site. This represents the proposed interference contour which falls wholly within the 40:1 dB ratio. As seen in the **Exhibit 8** Aerial Photograph, there is a lack of population, housing, buildings or major roads within this interference contour. The applicant would like to note the existence of the dedicated transmitter building located at the base of the tower. However, structures of this nature have been exempt as a matter of FCC Policy.

### Site Coordinates

(NGS NADCON)

	<u>Latitude</u>	<u>Longitude</u>
NAD 27 datum:	42 21 48.67454	72 25 23.69319
NAD 83 datum:	42 21 49.00000	72 25 22.00000

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

Google Earth

Google Earth Pro™  
Account #4375669785  
Used with Permission

4000 ft

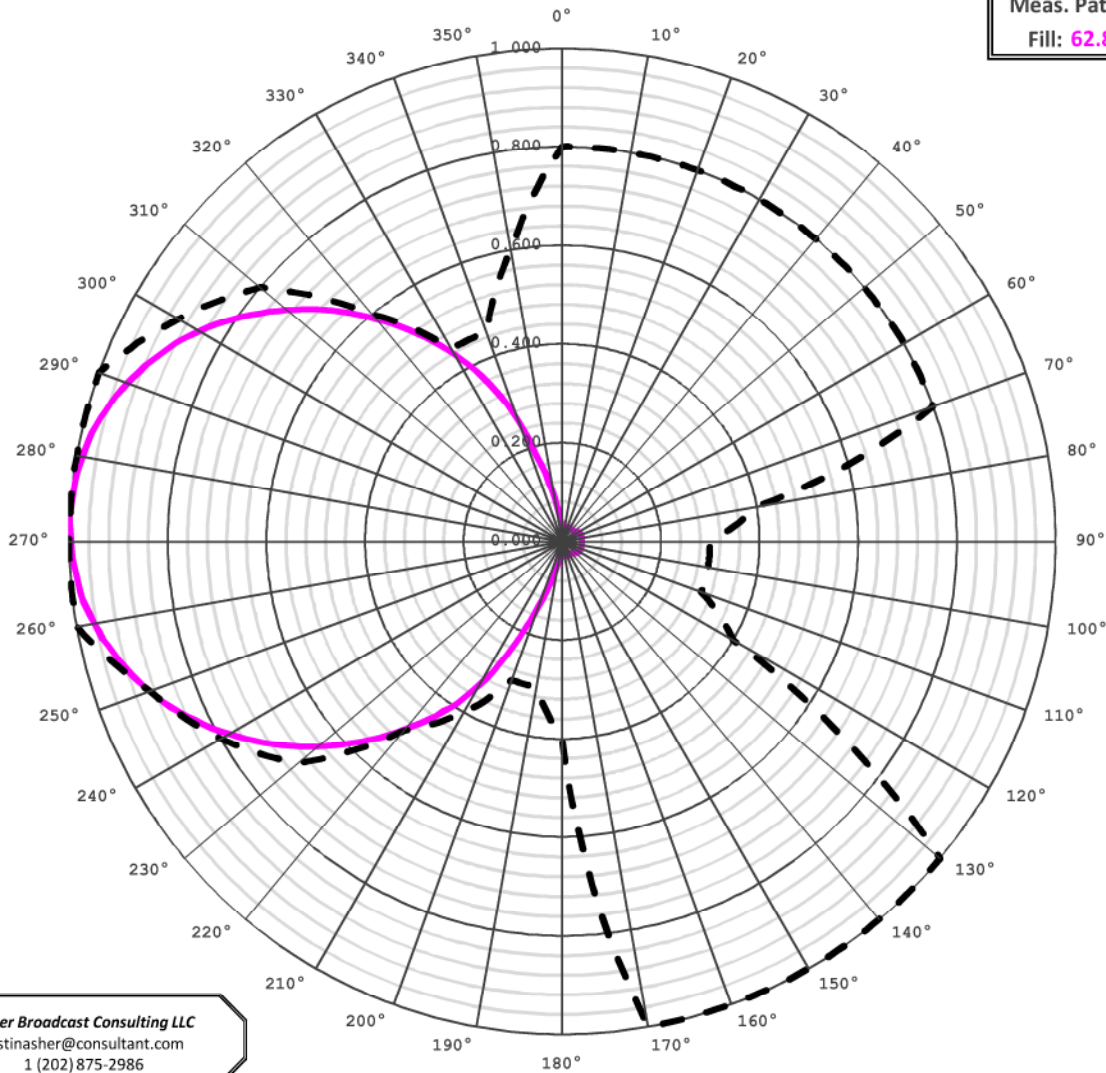


Manufacturer's	Make/Model	Orientation	Power
Element 1:	CI-FM(H&V)	273° True	100.0%
Element 2:			
Element 3:			
Element 4:			

Composite Power: 100%

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

Meas. Pattern  
Fill: 62.8%



Azimuth ° True	FCC Pattern	Manufacturer's Pattern
0°	0.800	0.030
10°	0.800	0.030
20°	0.800	0.030
30°	0.800	0.030
40°	0.800	0.030
50°	0.800	0.031
60°	0.800	0.037
70°	0.800	0.040
80°	0.400	0.040
90°	0.300	0.040
100°	0.300	0.040
110°	0.300	0.040
120°	0.400	0.039
130°	1.000	0.035
140°	1.000	0.030
150°	1.000	0.030
160°	1.000	0.030
170°	1.000	0.030
180°	0.400	0.030
190°	0.300	0.038
200°	0.300	0.142
210°	0.400	0.336
220°	0.500	0.498
230°	0.700	0.647
240°	0.800	0.781
250°	0.890	0.890
260°	1.000	0.964
270°	1.000	0.996
280°	1.000	0.988
290°	1.000	0.938
300°	0.900	0.851
310°	0.800	0.730
320°	0.600	0.588
330°	0.450	0.437
340°	0.450	0.256
350°	0.600	0.086

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 Pattern rotated to 273.0°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<sup>2</sup> (0.494 m<sup>2</sup>)

**CL-FM/HRM** 5.86 ft<sup>2</sup> (0.544 m<sup>2</sup>)

**CL-FM/VRM** 5.86 ft<sup>2</sup> (0.544 m<sup>2</sup>)

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

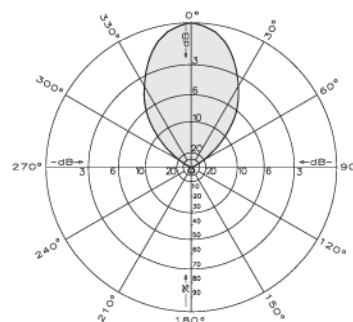
**CL-FM/VRM** Vertical polarization rear-mount

See reverse for order information.

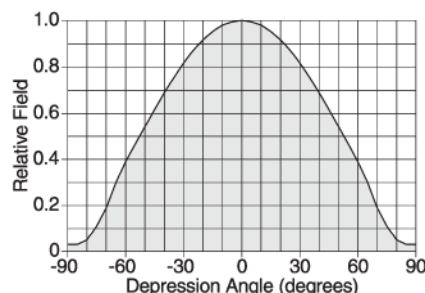
\* Mechanical design is based on environmental conditions as stipulated in EIA-222-F (June 1996) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.



10492-D



Azimuth pattern (E-plane)



Elevation pattern (H-plane)

## Exhibit 9

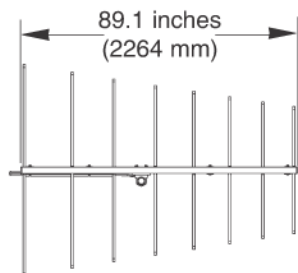
# Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Pattern rotated to 273.0°T)

## CL-FM

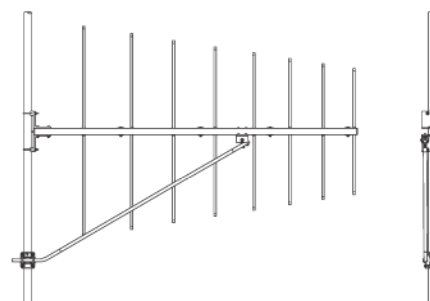
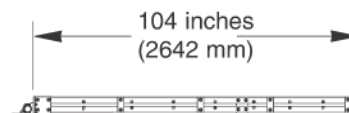
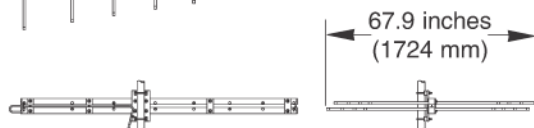
### FM LOG-PERIODIC ANTENNA

7 dBd gain

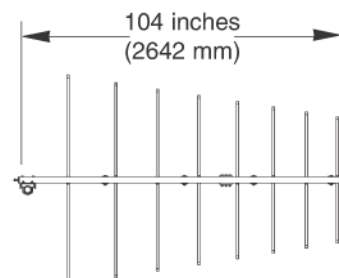
88–108 MHz



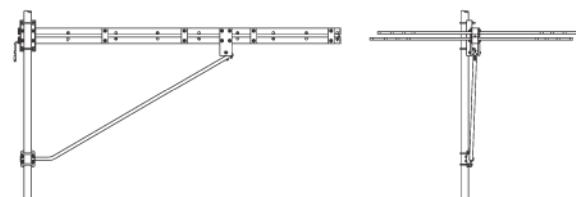
CL-FM/HCM  
Horizontally polarized



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:

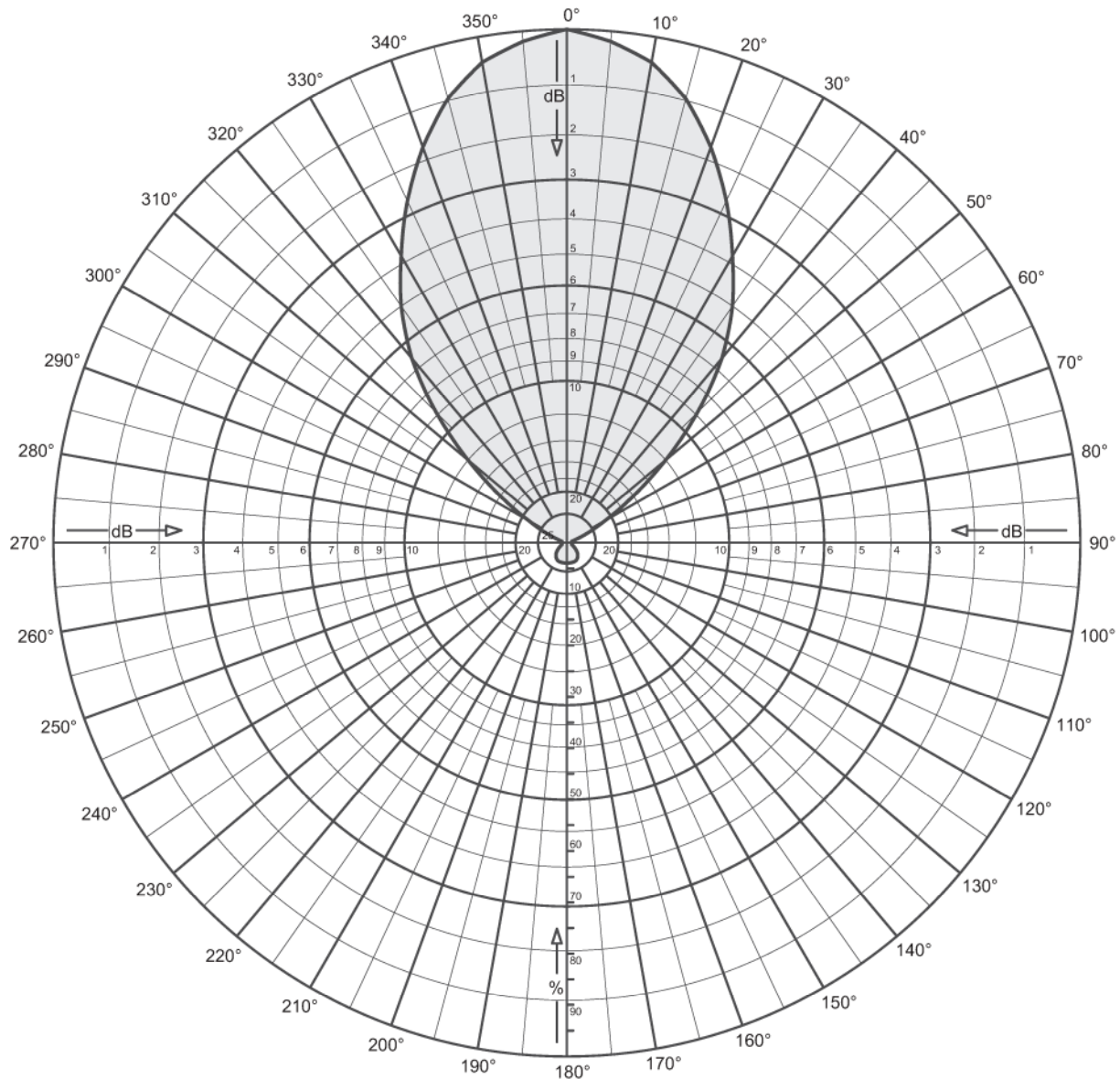
Model	Description
CL-FM/HRM/75N	Antenna with 75Ω N connector Horizontal polarization rear-mount
CL-FM/VRM/50N	Antenna with 50Ω N connector Vertical polarization rear-mount
CL-FM/VRM/75N	Antenna with 75Ω N connector Vertical polarization rear-mount

All specifications are subject to change without notice

## Exhibit 9

# Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Pattern rotated to 273.0°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 Pattern rotated to 273.0°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 Pattern rotated to 273.0°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 Pattern rotated to 273.0°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 Pattern rotated to 273.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Horizontal polarization Component

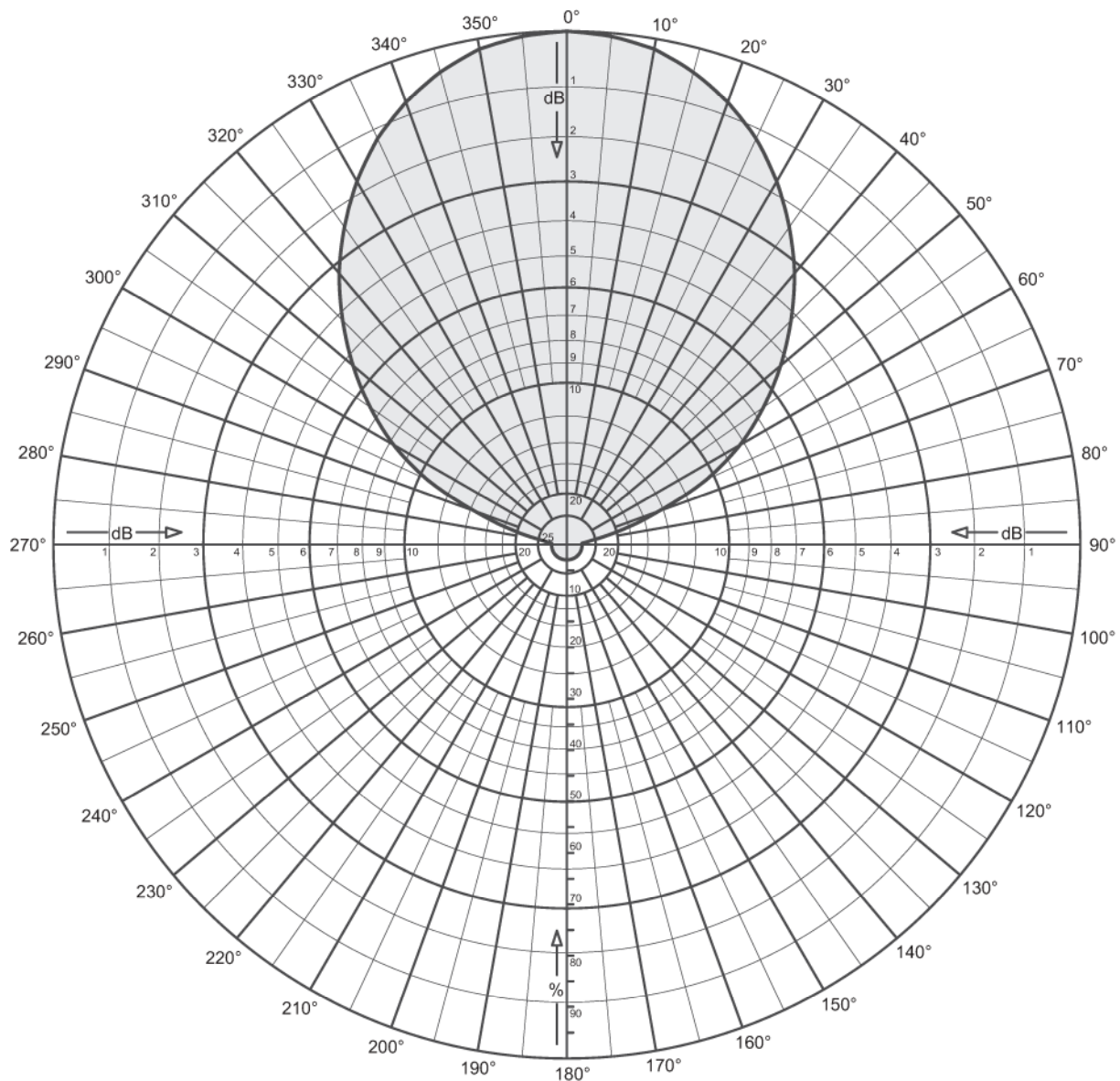
Horizontal radiation pattern

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 Pattern rotated to 273.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Vertical polarization Component

Horizontal radiation pattern

0 degree electrical downtilt





# Exhibit 9

## Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Pattern rotated to 273.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Vertical 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	0.618	-4.19	2.81	1.91
1	0.998	-0.01	6.99	5.00	46	0.602	-4.40	2.60	1.82
2	0.997	-0.02	6.98	4.99	47	0.588	-4.61	2.39	1.73
3	0.996	-0.03	6.97	4.97	48	0.573	-4.84	2.16	1.65
4	0.995	-0.04	6.96	4.96	49	0.558	-5.06	1.94	1.56
5	0.993	-0.06	6.94	4.95	50	0.544	-5.30	1.70	1.48
6	0.991	-0.08	6.92	4.92	51	0.528	-5.54	1.46	1.40
7	0.988	-0.10	6.90	4.89	52	0.513	-5.80	1.20	1.32
8	0.985	-0.13	6.87	4.87	53	0.498	-6.06	0.94	1.24
9	0.982	-0.15	6.85	4.84	54	0.483	-6.33	0.67	1.17
10	0.980	-0.18	6.82	4.81	55	0.467	-6.60	0.40	1.10
11	0.975	-0.22	6.78	4.76	56	0.452	-6.90	0.10	1.02
12	0.969	-0.27	6.73	4.71	57	0.436	-7.20	-0.20	0.95
13	0.964	-0.32	6.68	4.65	58	0.421	-7.51	-0.51	0.89
14	0.958	-0.37	6.63	4.60	59	0.405	-7.84	-0.84	0.82
15	0.952	-0.42	6.58	4.55	60	0.390	-8.18	-1.18	0.76
16	0.946	-0.49	6.51	4.48	61	0.372	-8.59	-1.59	0.69
17	0.938	-0.56	6.44	4.41	62	0.354	-9.02	-2.02	0.63
18	0.931	-0.62	6.38	4.34	63	0.336	-9.47	-2.47	0.57
19	0.923	-0.69	6.31	4.27	64	0.318	-9.95	-2.95	0.51
20	0.916	-0.76	6.24	4.21	65	0.300	-10.46	-3.46	0.45
21	0.908	-0.84	6.16	4.13	66	0.278	-11.12	-4.12	0.39
22	0.899	-0.92	6.08	4.05	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
24	0.882	-1.10	5.90	3.89	69	0.212	-13.47	-6.47	0.23
25	0.873	-1.18	5.82	3.82	70	0.190	-14.42	-7.42	0.18
26	0.862	-1.29	5.71	3.72	71	0.174	-15.19	-8.19	0.15
27	0.851	-1.41	5.59	3.63	72	0.158	-16.03	-9.03	0.13
28	0.840	-1.52	5.48	3.53	73	0.142	-16.95	-9.95	0.10
29	0.829	-1.63	5.37	3.44	74	0.126	-17.99	-10.99	0.08
30	0.817	-1.75	5.25	3.35	75	0.110	-19.17	-12.17	0.06
31	0.806	-1.88	5.12	3.25	76	0.098	-20.18	-13.18	0.05
32	0.793	-2.02	4.98	3.15	77	0.086	-21.31	-14.31	0.04
33	0.781	-2.15	4.85	3.05	78	0.074	-22.62	-15.62	0.03
34	0.767	-2.30	4.70	2.95	79	0.062	-24.15	-17.15	0.02
35	0.756	-2.44	4.56	2.86	80	0.050	-26.02	-19.02	0.01
36	0.742	-2.59	4.41	2.76	81	0.046	-26.74	-19.74	0.01
37	0.729	-2.74	4.26	2.67	82	0.042	-27.54	-20.54	0.01
38	0.716	-2.90	4.10	2.57	83	0.038	-28.40	-21.40	0.01
39	0.704	-3.05	3.95	2.48	84	0.034	-29.37	-22.37	0.01
40	0.690	-3.22	3.78	2.39	85	0.030	-30.46	-23.46	0.00
41	0.675	-3.41	3.59	2.29	86	0.030	-30.46	-23.46	0.00
42	0.661	-3.60	3.40	2.19	87	0.030	-30.46	-23.46	0.00
43	0.646	-3.79	3.21	2.09	88	0.030	-30.46	-23.46	0.00
44	0.632	-3.99	3.01	2.00	89	0.030	-30.46	-23.46	0.00

## Exhibit 9

# Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Pattern rotated to 273.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Vertical polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
90	0.030	-30.46	-23.46	0.00	135	0.030	-30.46	-23.46	0.00
91	0.030	-30.46	-23.46	0.00	136	0.030	-30.46	-23.46	0.00
92	0.030	-30.46	-23.46	0.00	137	0.030	-30.46	-23.46	0.00
93	0.030	-30.46	-23.46	0.00	138	0.030	-30.46	-23.46	0.00
94	0.030	-30.46	-23.46	0.00	139	0.030	-30.46	-23.46	0.00
95	0.030	-30.46	-23.46	0.00	140	0.030	-30.46	-23.46	0.00
96	0.030	-30.46	-23.46	0.00	141	0.030	-30.46	-23.46	0.00
97	0.030	-30.46	-23.46	0.00	142	0.030	-30.46	-23.46	0.00
98	0.030	-30.46	-23.46	0.00	143	0.030	-30.46	-23.46	0.00
99	0.030	-30.46	-23.46	0.00	144	0.030	-30.46	-23.46	0.00
100	0.030	-30.46	-23.46	0.00	145	0.030	-30.46	-23.46	0.00
101	0.030	-30.46	-23.46	0.00	146	0.030	-30.46	-23.46	0.00
102	0.030	-30.46	-23.46	0.00	147	0.030	-30.46	-23.46	0.00
103	0.030	-30.46	-23.46	0.00	148	0.030	-30.46	-23.46	0.00
104	0.030	-30.46	-23.46	0.00	149	0.030	-30.46	-23.46	0.00
105	0.030	-30.46	-23.46	0.00	150	0.030	-30.46	-23.46	0.00
106	0.030	-30.46	-23.46	0.00	151	0.030	-30.46	-23.46	0.00
107	0.030	-30.46	-23.46	0.00	152	0.030	-30.46	-23.46	0.00
108	0.030	-30.46	-23.46	0.00	153	0.030	-30.46	-23.46	0.00
109	0.030	-30.46	-23.46	0.00	154	0.030	-30.46	-23.46	0.00
110	0.030	-30.46	-23.46	0.00	155	0.030	-30.46	-23.46	0.00
111	0.030	-30.46	-23.46	0.00	156	0.030	-30.46	-23.46	0.00
112	0.030	-30.46	-23.46	0.00	157	0.030	-30.46	-23.46	0.00
113	0.030	-30.46	-23.46	0.00	158	0.030	-30.46	-23.46	0.00
114	0.030	-30.46	-23.46	0.00	159	0.030	-30.46	-23.46	0.00
115	0.030	-30.46	-23.46	0.00	160	0.030	-30.46	-23.46	0.00
116	0.030	-30.46	-23.46	0.00	161	0.030	-30.46	-23.46	0.00
117	0.030	-30.46	-23.46	0.00	162	0.030	-30.46	-23.46	0.00
118	0.030	-30.46	-23.46	0.00	163	0.030	-30.46	-23.46	0.00
119	0.030	-30.46	-23.46	0.00	164	0.030	-30.46	-23.46	0.00
120	0.030	-30.46	-23.46	0.00	165	0.030	-30.46	-23.46	0.00
121	0.030	-30.46	-23.46	0.00	166	0.030	-30.46	-23.46	0.00
122	0.030	-30.46	-23.46	0.00	167	0.030	-30.46	-23.46	0.00
123	0.030	-30.46	-23.46	0.00	168	0.030	-30.46	-23.46	0.00
124	0.030	-30.46	-23.46	0.00	169	0.030	-30.46	-23.46	0.00
125	0.030	-30.46	-23.46	0.00	170	0.030	-30.46	-23.46	0.00
126	0.030	-30.46	-23.46	0.00	171	0.030	-30.46	-23.46	0.00
127	0.030	-30.46	-23.46	0.00	172	0.030	-30.46	-23.46	0.00
128	0.030	-30.46	-23.46	0.00	173	0.030	-30.46	-23.46	0.00
129	0.030	-30.46	-23.46	0.00	174	0.030	-30.46	-23.46	0.00
130	0.030	-30.46	-23.46	0.00	175	0.030	-30.46	-23.46	0.00
131	0.030	-30.46	-23.46	0.00	176	0.030	-30.46	-23.46	0.00
132	0.030	-30.46	-23.46	0.00	177	0.030	-30.46	-23.46	0.00
133	0.030	-30.46	-23.46	0.00	178	0.030	-30.46	-23.46	0.00
134	0.030	-30.46	-23.46	0.00	179	0.030	-30.46	-23.46	0.00

## Exhibit 9

### Copy of Manufacturer's Directional Antenna Documentation (Actual Antenna Pattern rotated to 273.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Vertical polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
180	0.030	-30.46	-23.46	0.00	225	0.030	-30.46	-23.46	0.00
181	0.030	-30.46	-23.46	0.00	226	0.030	-30.46	-23.46	0.00
182	0.030	-30.46	-23.46	0.00	227	0.030	-30.46	-23.46	0.00
183	0.030	-30.46	-23.46	0.00	228	0.030	-30.46	-23.46	0.00
184	0.030	-30.46	-23.46	0.00	229	0.030	-30.46	-23.46	0.00
185	0.030	-30.46	-23.46	0.00	230	0.030	-30.46	-23.46	0.00
186	0.030	-30.46	-23.46	0.00	231	0.030	-30.46	-23.46	0.00
187	0.030	-30.46	-23.46	0.00	232	0.030	-30.46	-23.46	0.00
188	0.030	-30.46	-23.46	0.00	233	0.030	-30.46	-23.46	0.00
189	0.030	-30.46	-23.46	0.00	234	0.030	-30.46	-23.46	0.00
190	0.030	-30.46	-23.46	0.00	235	0.030	-30.46	-23.46	0.00
191	0.030	-30.46	-23.46	0.00	236	0.030	-30.46	-23.46	0.00
192	0.030	-30.46	-23.46	0.00	237	0.030	-30.46	-23.46	0.00
193	0.030	-30.46	-23.46	0.00	238	0.030	-30.46	-23.46	0.00
194	0.030	-30.46	-23.46	0.00	239	0.030	-30.46	-23.46	0.00
195	0.030	-30.46	-23.46	0.00	240	0.030	-30.46	-23.46	0.00
196	0.030	-30.46	-23.46	0.00	241	0.030	-30.46	-23.46	0.00
197	0.030	-30.46	-23.46	0.00	242	0.030	-30.46	-23.46	0.00
198	0.030	-30.46	-23.46	0.00	243	0.030	-30.46	-23.46	0.00
199	0.030	-30.46	-23.46	0.00	244	0.030	-30.46	-23.46	0.00
200	0.030	-30.46	-23.46	0.00	245	0.030	-30.46	-23.46	0.00
201	0.030	-30.46	-23.46	0.00	246	0.030	-30.46	-23.46	0.00
202	0.030	-30.46	-23.46	0.00	247	0.030	-30.46	-23.46	0.00
203	0.030	-30.46	-23.46	0.00	248	0.030	-30.46	-23.46	0.00
204	0.030	-30.46	-23.46	0.00	249	0.030	-30.46	-23.46	0.00
205	0.030	-30.46	-23.46	0.00	250	0.030	-30.46	-23.46	0.00
206	0.030	-30.46	-23.46	0.00	251	0.030	-30.46	-23.46	0.00
207	0.030	-30.46	-23.46	0.00	252	0.030	-30.46	-23.46	0.00
208	0.030	-30.46	-23.46	0.00	253	0.030	-30.46	-23.46	0.00
209	0.030	-30.46	-23.46	0.00	254	0.030	-30.46	-23.46	0.00
210	0.030	-30.46	-23.46	0.00	255	0.030	-30.46	-23.46	0.00
211	0.030	-30.46	-23.46	0.00	256	0.030	-30.46	-23.46	0.00
212	0.030	-30.46	-23.46	0.00	257	0.030	-30.46	-23.46	0.00
213	0.030	-30.46	-23.46	0.00	258	0.030	-30.46	-23.46	0.00
214	0.030	-30.46	-23.46	0.00	259	0.030	-30.46	-23.46	0.00
215	0.030	-30.46	-23.46	0.00	260	0.030	-30.46	-23.46	0.00
216	0.030	-30.46	-23.46	0.00	261	0.030	-30.46	-23.46	0.00
217	0.030	-30.46	-23.46	0.00	262	0.030	-30.46	-23.46	0.00
218	0.030	-30.46	-23.46	0.00	263	0.030	-30.46	-23.46	0.00
219	0.030	-30.46	-23.46	0.00	264	0.030	-30.46	-23.46	0.00
220	0.030	-30.46	-23.46	0.00	265	0.030	-30.46	-23.46	0.00
221	0.030	-30.46	-23.46	0.00	266	0.030	-30.46	-23.46	0.00
222	0.030	-30.46	-23.46	0.00	267	0.030	-30.46	-23.46	0.00
223	0.030	-30.46	-23.46	0.00	268	0.030	-30.46	-23.46	0.00
224	0.030	-30.46	-23.46	0.00	269	0.030	-30.46	-23.46	0.00

# Exhibit 9

## Copy of Manufacturer's Directional Antenna Documentation

(Actual Antenna Pattern rotated to 273.0°T) (public record copy)



CL-FM

FM

Maximum gain: 7.0 dBd

Vertical polarization Component

Horizontal radiation pattern

0 degree electrical downtilt

Angle	Field	Rel.dB	dBd	PwrMult	Angle	Field	Rel.dB	dBd	PwrMult
270	0.030	-30.46	-23.46	0.00	315	0.618	-4.19	2.81	1.91
271	0.030	-30.46	-23.46	0.00	316	0.632	-3.99	3.01	2.00
272	0.030	-30.46	-23.46	0.00	317	0.646	-3.79	3.21	2.09
273	0.030	-30.46	-23.46	0.00	318	0.661	-3.60	3.40	2.19
274	0.030	-30.46	-23.46	0.00	319	0.675	-3.41	3.59	2.29
275	0.030	-30.46	-23.46	0.00	320	0.690	-3.22	3.78	2.39
276	0.034	-29.37	-22.37	0.01	321	0.704	-3.05	3.95	2.48
277	0.038	-28.40	-21.40	0.01	322	0.716	-2.90	4.10	2.57
278	0.042	-27.54	-20.54	0.01	323	0.729	-2.74	4.26	2.67
279	0.046	-26.74	-19.74	0.01	324	0.742	-2.59	4.41	2.76
280	0.050	-26.02	-19.02	0.01	325	0.756	-2.44	4.56	2.86
281	0.062	-24.15	-17.15	0.02	326	0.767	-2.30	4.70	2.95
282	0.074	-22.62	-15.62	0.03	327	0.781	-2.15	4.85	3.05
283	0.086	-21.31	-14.31	0.04	328	0.793	-2.02	4.98	3.15
284	0.098	-20.18	-13.18	0.05	329	0.806	-1.88	5.12	3.25
285	0.110	-19.17	-12.17	0.06	330	0.817	-1.75	5.25	3.35
286	0.126	-17.99	-10.99	0.08	331	0.829	-1.63	5.37	3.44
287	0.142	-16.95	-9.95	0.10	332	0.840	-1.52	5.48	3.53
288	0.158	-16.03	-9.03	0.13	333	0.851	-1.41	5.59	3.63
289	0.174	-15.19	-8.19	0.15	334	0.862	-1.29	5.71	3.72
290	0.190	-14.42	-7.42	0.18	335	0.873	-1.18	5.82	3.82
291	0.212	-13.47	-6.47	0.23	336	0.882	-1.10	5.90	3.89
292	0.234	-12.62	-5.62	0.27	337	0.890	-1.01	5.99	3.97
293	0.256	-11.84	-4.84	0.33	338	0.899	-0.92	6.08	4.05
294	0.278	-11.12	-4.12	0.39	339	0.908	-0.84	6.16	4.13
295	0.300	-10.46	-3.46	0.45	340	0.916	-0.76	6.24	4.21
296	0.318	-9.95	-2.95	0.51	341	0.923	-0.69	6.31	4.27
297	0.336	-9.47	-2.47	0.57	342	0.931	-0.62	6.38	4.34
298	0.354	-9.02	-2.02	0.63	343	0.938	-0.56	6.44	4.41
299	0.372	-8.59	-1.59	0.69	344	0.946	-0.49	6.51	4.48
300	0.390	-8.18	-1.18	0.76	345	0.952	-0.42	6.58	4.55
301	0.405	-7.84	-0.84	0.82	346	0.958	-0.37	6.63	4.60
302	0.421	-7.51	-0.51	0.89	347	0.964	-0.32	6.68	4.65
303	0.436	-7.20	-0.20	0.95	348	0.969	-0.27	6.73	4.71
304	0.452	-6.90	0.10	1.02	349	0.975	-0.22	6.78	4.76
305	0.467	-6.60	0.40	1.10	350	0.980	-0.18	6.82	4.81
306	0.483	-6.33	0.67	1.17	351	0.982	-0.15	6.85	4.84
307	0.498	-6.06	0.94	1.24	352	0.985	-0.13	6.87	4.87
308	0.513	-5.80	1.20	1.32	353	0.988	-0.10	6.90	4.89
309	0.528	-5.54	1.46	1.40	354	0.991	-0.08	6.92	4.92
310	0.544	-5.30	1.70	1.48	355	0.993	-0.06	6.94	4.95
311	0.558	-5.06	1.94	1.56	356	0.995	-0.04	6.96	4.96
312	0.573	-4.84	2.16	1.65	357	0.996	-0.03	6.97	4.97
313	0.588	-4.61	2.39	1.73	358	0.997	-0.02	6.98	4.99
314	0.602	-4.40	2.60	1.82	359	0.998	-0.01	6.99	5.00