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**Engineering Statement  
Application for a new Digital-to-Digital Replacement Translator  
Channel 22 at Janesville, Wisconsin  
For WISC-TV  
July 2021**

**I. Background**

This Engineering Statement has been prepared on behalf of Television Wisconsin, Inc. ("TVW"), the licensee of digital TV station WISC-TV at Madison, Wisconsin. This material has been prepared in connection with an application for a new Digital-to-Digital Replacement Translator ("DTDRT") at Janesville, Wisconsin, on UHF Channel 22.

The Commission established the DTDRT service to allow eligible full power television stations to recover lost digital service area that resulted from the reverse auction and repacking process.<sup>1</sup> The Commission concluded that this replacement service may be needed for full power stations that are reassigned to new channels, either in the repacking process or through a winning UHF-to-VHF bid, if the full power station discovered that a portion of their existing pre-auction digital service area was lost after the station transitioned to its new channel. Among other considerations favoring the establishment of this replacement service, the Commission acknowledged that "because radio signals propagate differently on different frequencies, the signal of a station reassigned to a different channel will generally not be receivable in precisely the same locations within a station's contour as it was on the original channel."<sup>2</sup>

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<sup>1</sup> *Amendment of Parts 73 and 74 of the Commission's Rules to Establish Rules for Digital Low Power Television and Television Translator Stations*, Third Report and Order and Fourth Notice of Proposed Rulemaking, MB Docket No. 03-185, FCC 15-175, released December 17, 2015.

<sup>2</sup> *Ibid*, Footnote 199.

As a part of the DTDRT application process, applicants are required to demonstrate a loss of a portion of their pre-auction digital service area. The Commission declined to establish a specific format for these showings, stating that “[w]e believe that applicants should have flexibility in engineering their showings, provided that they give an accurate assessment of the loss in the pre-auction digital service area.”<sup>3</sup> Our analysis of the WISC-TV digital service loss, resulting from the station’s repack from a UHF to a VHF channel, follows.

## **II. Lost Digital Service Area**

WISC-TV is the CBS network affiliate in Madison, Wisconsin. WISC-TV for many years operated on UHF Channel 50. Following completion of the Broadcast Incentive Auction, the Commission’s *Channel Reassignment Public Notice* (DA 17-314), released on April 13, 2017, specified WISC-TV’s post-auction facilities on VHF Channel 11. Accordingly, the station completed construction of its Ch11 facility, filing its covering license application on May 1, 2020 (0000113047). WISC-TV subsequently filed a minor modification application for a power increase, and filed the subsequent covering license application on November 19, 2020 (0000126605).

Since that time, the station has experienced numerous complaints of difficulties in reception of the VHF signal, where viewers had previously been able to receive the UHF signal without problem. A large percentage of these complaints appear to originate from viewers who use indoor set-top antennas. From these complaints, it is apparent that in-building penetration of the VHF signal presents challenges, particularly where viewers had become accustomed to UHF indoor reception.

In the paper "Planning Factors for Fixed and Portable DTTV Reception" authored by Oded Bendov, Yiyen Wu, Charles W. Rhodes, and John F.X. Browne and presented at the IEEE 2003 Broadcast Technical Symposium <sup>4</sup> (the “Bendov Paper”), the authors established that the Commission’s service prediction and link budget for digital terrestrial television (“DTTV”) had serious shortfalls. Field tests showed that the actual incident field strength required at the receiver for robust

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<sup>3</sup> Ibid, Footnote 212.

<sup>4</sup> "Planning Factors for Fixed and Portable DTTV Reception" by Oded Bendov, Yiyen Wu, Charles W. Rhodes, and John F.X. Browne, *IEEE Transactions on Broadcasting*, Vol. 50, No. 3, September 2004.

reception was 10-20 dB higher than called for in the planning factors adopted by the Commission, with an even greater value required for reception on indoor antennas.

As a result of their research as described in the paper, Bendov et al developed updated link budget and service grades for both fixed and portable DTTV reception, including a calculation of an equivalent minimum field strength at 10 meters above ground which allows for indoor reception of DTTV on set-top non-directional antennas. This link budget was presented in their Table II (duplicated in relevant part below), and shows that a receiver utilizing an indoor set-top antenna requires an equivalent minimum signal of 90 dBu at VHF and 93 dBu at UHF at the building exterior, to allow for height and building penetration losses.

	Set-top Non-directional Antenna <sup>3</sup>			
	69 MHz	194 MHz	615 MHz	
Thermal noise (kT <sub>0</sub> B)	-106.2	-106.2	-106.2	dBm
Noise level at antenna (see Figure 9)	21.6	17.1	15.4	dB/kT <sub>0</sub> B
Threshold SNR	16	16	16	dB
Minimum Power required for decoding exclusive of margins	-68.6	-73.1	-74.8	dBm, Outdoor
Antenna gain**	-10	-5	0	dB
Equivalent minimum "field strength"	53	53	56	dBu; Outdoor
Combined height and ground floor penetration loss for signal and noise	37	37	37	dB
<b>Equivalent minimum "field strength" at 10 m above ground for indoor reception</b>	<b>90</b>	<b>90</b>	<b>93</b>	<b>dBu</b>
Equalizer Added Noise Margin for Light to Medium Multipath	0-3	0-3	0-3	dB

3  
 Threshold SNR includes .8dB penalty due to Tx's degradation.  
 Single receiver. Add 3.5 dB loss for second receiver  
 Median residential Man-made noise level  
 Median sky temperature  
 \*Estimated for VHF  
 Antenna VSWR=3  
 Front-end VSWR=3  
 Antenna to front-end cable=3'  
 Noise Figure with matched antenna=10  
 \*\*Estimate based on wavelength ratio  
 Antenna 1.5 meters above ground

Table II from Bendov, et al

Accordingly, a study has been made to document the effect which the WISC-TV repack onto a VHF channel has had upon the capability of the station's audience to receive the station on an indoor

antenna. These studies have been prepared using Longley-Rice signal prediction results from the Commission's TVStudy software. All population figures quoted are per the 2010 Census.

The attached Exhibit A presents a graphic analysis which clearly illustrates the reduction in WISC-TV indoor reception penetration which has resulted from the station's repack onto a VHF channel. The predicted 90 dBu signal strength from the station's current Ch11 operation (orange shading) has been overlaid on top of the predicted 93 dBu signal strength from the prior Ch50 operation (green shading). Wherever the green shading shows on this map, the repacked WISC-TV has lost capability for indoor reception, per the link budget developed by Bendov et al.

Where the prior Ch50 operation provided a 93 dBu signal to a population of 647,138 persons, the current Ch11 operation provides a 90 dBu signal to a population of just 483,238 persons. This represents an indoor reception capability shortfall to 163,900 persons, and comes at a time when a record number of consumers are dropping their subscriptions to cable and direct broadcast satellite subscription services. (See "Report: Wisconsinites follow national trend in cutting cable subscriptions", *Wisconsin State Journal*, November 28, 2020.<sup>5</sup>)

From inspection of the map exhibit, this service area shortfall is particularly notable in areas which are located more than 35 kilometers east of the WISC-TV transmitter site. The largest community affected by this indoor reception shortfall is Janesville, Wisconsin, an incorporated city with a 2010 Census population of 63,575 persons. Janesville is located about 60 kilometers southeast of the WISC-TV transmitter site.

In order to remedy this loss of indoor reception service resulting from the station's repack onto a VHF channel, WISC-TV proposes herein to construct a DTDRT on UHF Channel 22 to serve Janesville.

The attached Exhibit B overlays the predicted 93 dBu signal (red shading) from the proposed Janesville DTDRT facility on top of the analysis which was presented in Exhibit A. Operation of the

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[https://madison.com/wsj/business/report-wisconsinites-follow-national-trend-in-cutting-cable-subscriptions/article\\_614a56f7-10e9-5c82-9d95-6c38c3362b72.html](https://madison.com/wsj/business/report-wisconsinites-follow-national-trend-in-cutting-cable-subscriptions/article_614a56f7-10e9-5c82-9d95-6c38c3362b72.html) (accessed July 10, 2021)

DTDRT will provide a 93 dBu signal to nearly all of Janesville, thereby ensuring that viewers who were long accustomed to receiving WISC-TV's CBS network programming on an indoor antenna will once again have that capability.<sup>6</sup>

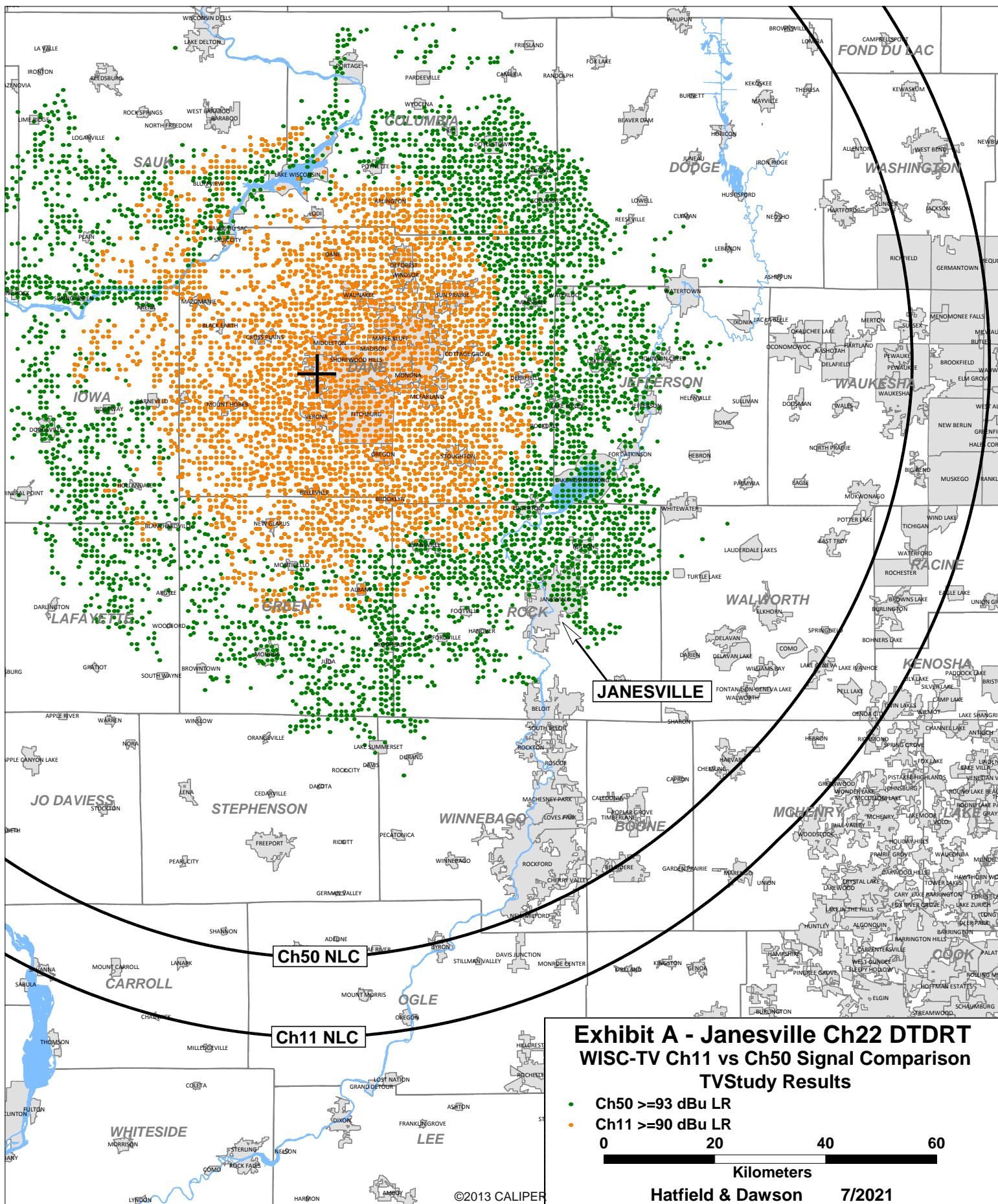
The Ch22 Janesville DTDRT facility is predicted by TVStudy to provide a 93 dBu signal to 82,871 persons, of which 79,217 are not already covered by a 90 dBu signal from the main WISC-TV Ch11 facility. Thus, the total non-duplicated indoor reception population for WISC-TV will increase from 483,238 to 562,455 persons, representing an improvement of 16%. While this is far from a complete reclamation of the station's prior indoor reception capability, it nevertheless represents a significant step forward and targets the largest population center (Janesville) which has lost indoor reception capability as a result of the primary facility's transition from UHF to VHF.<sup>7</sup>

The Ch22 replacement translator will provide some additional indoor reception service beyond that which the prior Ch51 primary facility provided. However, this does not represent a significant expansion of that level of service, and is believed to be acceptable within the Commission's allowance for *de minimis* expansion. It should also be noted that the Ch22 replacement translator 49.6 dBu coverage contour will be completely contained within the WISC-TV Ch11 36 dBu noise limited contour as well as the prior WISC-TV Ch50 42 dBu noise limited contour.

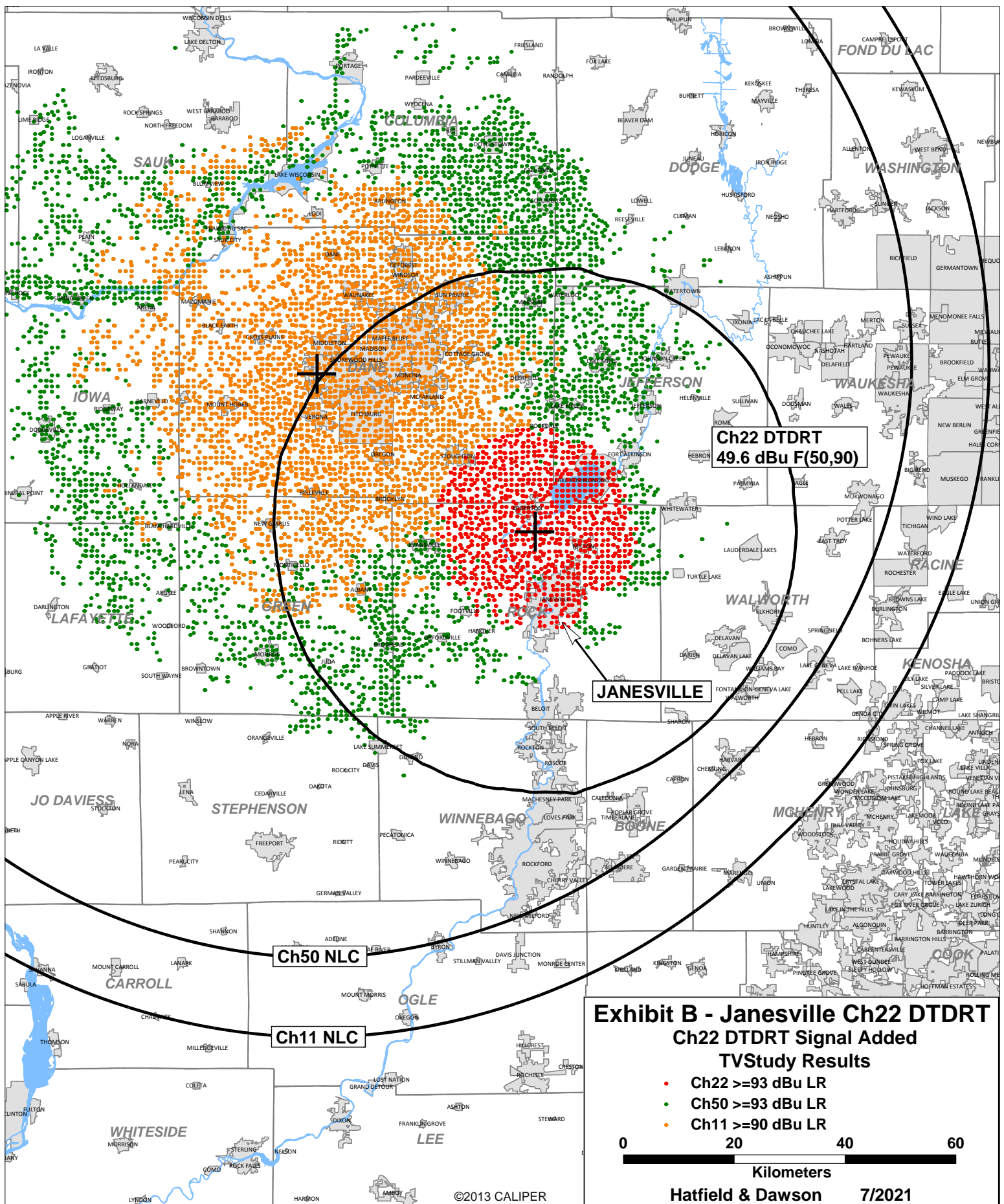
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<sup>6</sup> It is noted that the other major network stations serving the Madison DMA all operate on UHF RF channels. ABC network programming is on WKOW Ch26, NBC is on WMTV Ch19, Fox is on WMSN-TV Ch18, and PBS is on WHA-TV Ch20.

<sup>7</sup> While no study was undertaken in connection with this application to document the population of indoor antenna users in Janesville, it is posited that larger population centers tend to have a higher number of renters and other residents who are more likely to utilize indoor antennas.







### III. Interference Study

Study has been made of all cochannel and adjacent-channel facilities in the vicinity of the proposed operation, including a detailed Longley-Rice interference study to demonstrate that the proposed operation will not cause interference to any authorized or pending proposed facilities. This study was performed using the Commission's TVStudy software.

**Study notes:**

This study was performed using a 0.5 kilometer study cell size, and a 0.2 kilometer terrain extraction increment (aka profile point spacing).

This study excludes from consideration BMLEDT-20091116ABD for WVCY-TV on Channel 22 at Milwaukee. BMLEDT-20091116ABD is still an active record in the Commission's LMS database. However, WVCY-TV sold its RF Channel 22 spectrum in the 2017 Broadcast Incentive Auction and entered into a channel sharing agreement with WITI(TV) on RF Channel 31. WVCY-TV transitioned to its channel sharing facility in January 2018, and is now licensed as 0000087194. Therefore, the WVCY-TV Channel 22 license BMLEDT-20091116ABD no longer requires protection and should be set to inactive in the database.

The results of this study indicate that the proposed facility is predicted to cause zero additional interference to any of the listed stations, beyond the allowed values of 0.5% to full-power and Class A stations, and 2.0% to low-power stations. Based on the foregoing interference study, it is believed that the proposed facility can operate without risk of interference to other stations.

Study created: 2021.07.12 17:52:02

Study build station data: LMS TV 2021-07-12

Proposal: JANE22 D22 LD APP JANESVILLE, WI  
File number: JANE22  
Facility ID: 99999  
Station data: User record  
Record ID: 1275  
Country: U.S.  
Zone: I

Build options:  
Protect pre-transition records not on baseline channel

**Individual records excluded:**  
**20091116ABD WVCY-TV D22 DT LIC \*P MILWAUKEE, WI BMLEDT20091116ABD**

Stations potentially affected by proposal:



IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	W35DY-D	N19-	TX	LIC	STERLING-DIXON, IL	BLTT20070806AFB	110.1 km
No	KGOW	D21	DT	LIC	BURLINGTON, IA	BLANK0000107917	196.9
No	WJYS	D21	DT	LIC	HAMMOND, IN	BLANK0000087539	155.2
Yes	WIFS	D21	DT	LIC	JANESVILLE, WI	BLANK0000090143	48.3
No	W21EF-D	D21-	LD	LIC	WAUPACA, WI	BLANK0000121378	149.9
Yes	KPXR-TV	D22	DT	LIC	CEDAR RAPIDS, IA	BLANK0000063428	238.6
No	K22LJ-D	D22	LD	CP	MASON CITY, IA	BNPDTL20100723AQR	352.0
No	WRJK-LP	N22-	TX	LIC	ARLINGTON HEIGHTS, IL	BLTT19991020AAO	114.7
Yes	WLS-TV	D22	DT	CP	CHICAGO, IL	BLANK0000086908	155.2
No	WBUI	D22	DT	LIC	DECATUR, IL	BLCDT20091119ACF	317.5
No	WVDM-LD	D22	LD	LIC	QUINCY, IL	BLANK0000083846	426.5
No	WXIN	D22	DT	LIC	INDIANAPOLIS, IN	BLANK0000093989	401.7
No	W22DW-D	D22	LD	CP	LAFAYETTE, IN	BLANK0000036239	280.5
No	WLLA	D22	DT	LIC	KALAMAZOO, MI	BLANK0000122579	295.0
No	WPBN-TV	D22	LD	LIC	TRAVERSE CITY, MI	BLANK0000143350	315.2
No	W22FD-D	D22	LD	CP	DODGE CENTER, MN	BLANK0000071791	330.3
No	WUCW	D22	DT	LIC	MINNEAPOLIS, MN	BLCDT20060405AAI	412.4
No	KHQA-TV	D22	DT	CP	HANNIBAL, MO	BLANK0000127627	367.2
No	WBGU-TV	D22	DT	LIC	BOWLING GREEN, OH	BLANK0000063785	463.8
No	W22FK-D	D22	LD	CP	BARABOO, WI	BLANK0000151596	163.1
No	W22DT-D	D22	LD	CP	GALESVILLE, WI	BNPDTL20090825CBA	235.6
Yes	WFRV-TV	D22	DT	LIC	GREEN BAY, WI	BLANK0000086896	191.0
No	WCIU-TV	D23	DT	LIC	CHICAGO, IL	BLANK0000102906	155.1
No	WQPT-TV	D23	DT	LIC	MOLINE, IL	BLANK0000142182	198.3
No	WFBN-LD	D23	LD	LIC	ROCKFORD, IL	BLANK0000087738	56.8
No	KQEG-CD	D23	DC	LIC	LA CRESCENT, MN	BLANK0000001542	209.8
No	WBAY-TV	D23	DT	LIC	GREEN BAY, WI	BMLCDT20040723ADS	197.9
Yes	W23BW-D	D23	DC	CP	MADISON, WI	BLANK0000127546	44.4
Yes	W23BW-D	D23	DC	LIC	MADISON, WI	BLDTA20140827AAD	44.4
No	WTAS-LP	D23-	LD	CP	WAUKESHA, WI	BLANK0000142987	72.9
No	WTAS-LP	D23-	LD	LIC	WAUKESHA, WI	BLANK0000151967	72.9
No	WMKB-LP	N25z	TX	LIC	Rochelle, IL	BLTTL20070813AFM	90.2
No	WPVS-LP	N29z	TX	LIC	MILWAUKEE, WI	BLTTL20080221AAP	120.9

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D22  
Mask: Full Service  
Latitude: 42 48 2.00 N (NAD83)  
Longitude: 89 3 16.00 W  
Height AMSL: 396.0 m  
HAAT: 0.0 m  
Peak ERP: 15.0 kW  
Antenna: Omnidirectional  
Elev Pattn: Generic  
Elec Tilt: 0.75

49.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	15.0 kW	127.3 m	46.8 km
45.0	15.0	156.7	48.9
90.0	15.0	130.2	47.0
135.0	15.0	119.8	46.3
180.0	15.0	129.7	47.0
225.0	15.0	124.3	46.6
270.0	15.0	127.3	46.8
315.0	15.0	129.0	46.9

Database HAAT does not agree with computed HAAT  
Database HAAT: 0 m Computed HAAT: 131 m

Distance to Canadian border: 489.4 km

Distance to Mexican border: 1818.1 km

Conditions at FCC monitoring station: Allegan MI  
 Bearing: 93.8 degrees Distance: 254.0 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:  
 Bearing: 263.1 degrees Distance: 1376.1 km

**Study cell size: 0.50 km**  
**Profile point spacing: 0.20 km**

Maximum new IX to full-service and Class A: 0.50%  
 Maximum new IX to LPTV: 2.00%

---- Below is IX received by proposal JANE22 ----

Proposal receives 10.62% interference from scenario 1  
 Proposal receives 29.07% interference from scenario 2  
**No IX check failures found.**

#### IV. RF Exposure Study

The power density calculations shown below were made using the techniques outlined in OET Bulletin No. 65. "Ground level" calculations in this report have been made at a reference height of 2 meters above ground to provide a worst-case estimate of exposure for persons standing on the ground in the vicinity of the tower. The equation shown below was used to calculate the ground level power density figures from each antenna.

$$S(\mu W / cm^2) = \frac{33.40981 \times AdjERP(Watts)}{D^2}$$

Where: *AdjERP(Watts)* is the maximum lobe effective radiated power times the element pattern factor times the array pattern factor.

*D* is the distance in meters from the center of radiation to the calculation point.

Power density levels produced by the proposed facility were calculated for an elevation of 2 meters above ground using the manufacturer's vertical plane pattern for the horizontally-polarized ERI model ALP8L3 antenna proposed in this application. The highest calculated power density from the proposed antenna alone occurs at a point 46 meters from the base of the antenna support structure. At this point the power density from the proposed facility is calculated to be 2.0  $\mu W/cm^2$ , which is 0.6% of 345.3  $\mu W/cm^2$  (the FCC maximum for uncontrolled environments at the Channel 22 frequency).

These calculations show that the maximum calculated power density produced at two meters above ground level by the proposed operation alone is less than 5% of the applicable FCC exposure limit at all locations between 1 and 500 meters from the base of the antenna support structure. Section 1.1307(b) of the Commission's Rules excludes applications for new facilities or modifications to existing facilities from the requirement of preparing an environmental assessment when the calculated emissions from the applicant's proposed facility are predicted to be less than 5% of the applicable FCC exposure limit. Therefore, the proposed facility is in compliance with Section 1.1301 *et seq* and no further analysis of RF exposure at this site is required in this application.

Pursuant to OET Bulletin No. 65, all station personnel and contractors are required to follow appropriate safety procedures before any work is commenced on the antenna tower, including reduction in power or discontinuance of operation before any maintenance work is undertaken. The permittee/licensee in coordination with other users of the site must reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency exposure in excess of FCC guidelines.

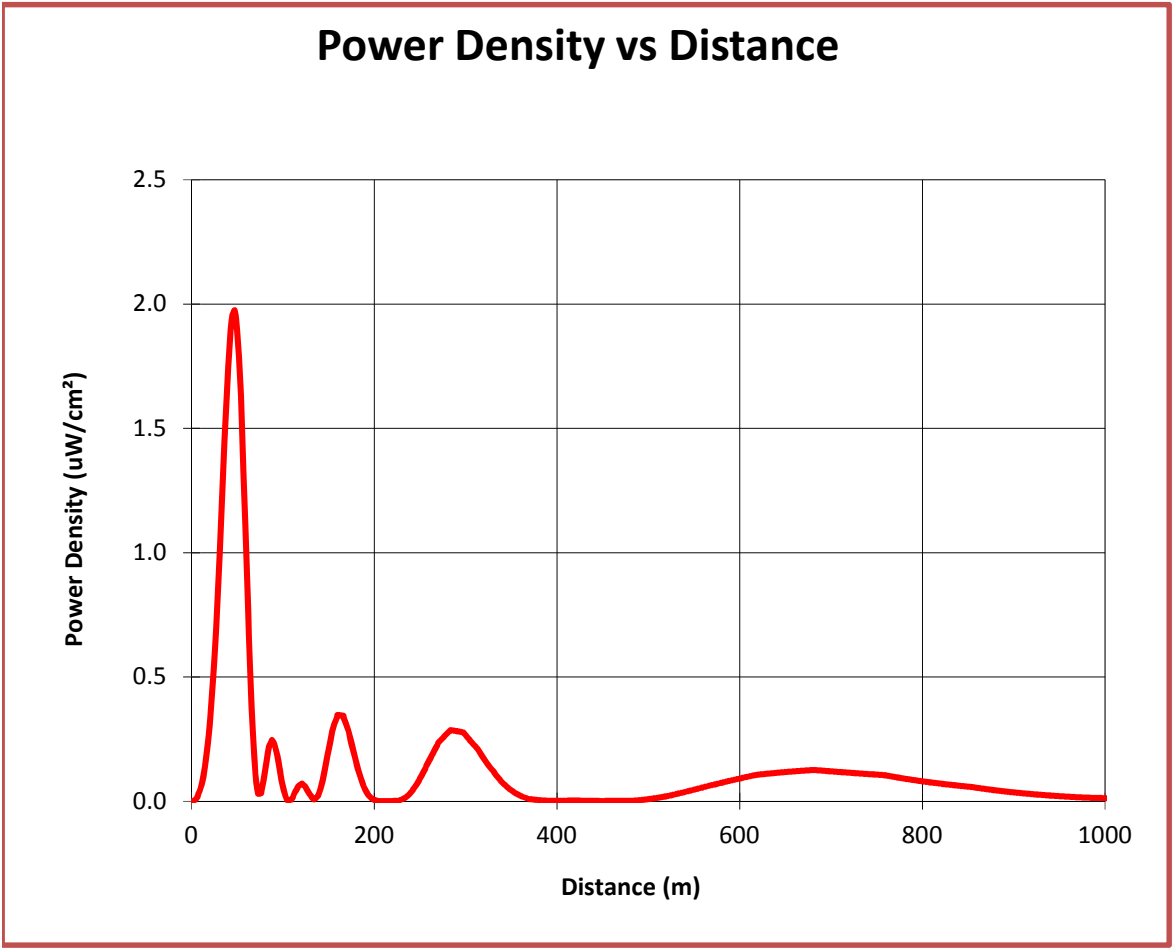
July 12, 2021

Erik C. Swanson, P.E.

WISC-DTDRT Ch22 Janesville  
Ground-Level Power Density Calculations  
Using Manufacturer's Vertical Plane Pattern

Antenna	ALP8L3		
ERP	15,000	Watts H (avg)	
	-	Watts V (avg)	
Antenna AGL	121.9	meters less 2m is	119.9 meters above the reference plane
MBT	0	degrees	

Calculated  
Maximum is 2.0  $\mu\text{W}/\text{cm}^2$  at 46 meters from the tower



**WISC-DTDR Ch22 Janesville**  
**Ground-Level Power Density Calculations**  
**Using Manufacturer's Vertical Plane Pattern**

Distance From Tower (meters)	Hypotenuse (meters)	Depression Angle (with MBT adjust) (degrees)	Interpolated Rel Field	Adjusted ERP (watts)	Power Density uW/cm <sup>2</sup>
0	119.90	90.00	0.000	0.0	0.00
1	119.90	89.52	0.004	0.3	0.00
2	119.92	89.04	0.009	1.1	0.00
3	119.94	88.57	0.012	2.3	0.01
4	119.97	88.09	0.016	4.0	0.01
5	120.00	87.61	0.021	6.5	0.02
6	120.05	87.14	0.026	9.9	0.02
7	120.10	86.66	0.030	13.6	0.03
8	120.17	86.18	0.034	17.7	0.04
9	120.24	85.71	0.039	22.7	0.05
10	120.32	85.23	0.044	28.6	0.07
11	120.40	84.76	0.049	35.5	0.08
12	120.50	84.28	0.054	43.5	0.10
13	120.60	83.81	0.059	52.7	0.12
14	120.71	83.34	0.065	63.2	0.14
15	120.83	82.87	0.071	75.0	0.17
16	120.96	82.40	0.077	88.5	0.20
17	121.10	81.93	0.083	103.3	0.24
18	121.24	81.46	0.090	120.2	0.27
19	121.40	81.00	0.096	138.4	0.31
20	121.56	80.53	0.103	157.8	0.36
21	121.73	80.07	0.109	178.5	0.40
22	121.90	79.60	0.116	201.7	0.45
23	122.09	79.14	0.123	226.5	0.51
24	122.28	78.68	0.130	253.9	0.57
25	122.48	78.22	0.137	283.4	0.63
26	122.69	77.76	0.145	315.4	0.70
27	122.90	77.31	0.153	349.9	0.77
28	123.13	76.86	0.160	386.2	0.85
29	123.36	76.40	0.168	424.1	0.93
30	123.60	75.95	0.176	463.4	1.01
31	123.84	75.50	0.183	502.0	1.09
32	124.10	75.06	0.190	542.0	1.18
33	124.36	74.61	0.197	583.4	1.26
34	124.63	74.17	0.204	626.1	1.35
35	124.90	73.73	0.211	668.4	1.43
36	125.19	73.29	0.218	710.8	1.52
37	125.48	72.85	0.224	752.3	1.60
38	125.78	72.41	0.230	790.8	1.67
39	126.08	71.98	0.235	829.7	1.74
40	126.40	71.55	0.239	860.4	1.80
41	126.72	71.12	0.244	891.4	1.85
42	127.04	70.70	0.247	916.1	1.90
43	127.38	70.27	0.250	938.3	1.93
44	127.72	69.85	0.252	956.0	1.96

45	128.07	69.43	0.254	965.6	1.97
46	128.42	69.01	0.255	975.1	1.98
47	128.78	68.60	0.255	972.3	1.96
48	129.15	68.18	0.254	969.1	1.94
49	129.53	67.77	0.252	955.6	1.90
50	129.91	67.36	0.250	934.1	1.85
51	130.30	66.96	0.246	911.3	1.79
52	130.69	66.55	0.242	875.9	1.71
53	131.09	66.15	0.237	841.4	1.64
54	131.50	65.75	0.231	797.5	1.54
55	131.91	65.36	0.223	748.9	1.44
56	132.33	64.96	0.216	701.1	1.34
57	132.76	64.57	0.207	644.0	1.22
58	133.19	64.19	0.198	589.6	1.11
59	133.63	63.80	0.188	532.3	1.00
60	134.07	63.42	0.178	473.4	0.88
61	134.53	63.03	0.167	418.2	0.77
62	134.98	62.66	0.155	358.8	0.66
63	135.44	62.28	0.142	303.6	0.55
64	135.91	61.91	0.130	252.6	0.46
65	136.39	61.54	0.117	204.6	0.37
66	136.86	61.17	0.104	162.0	0.29
67	137.35	60.80	0.091	124.0	0.22
68	137.84	60.44	0.078	90.9	0.16
69	138.34	60.08	0.065	63.2	0.11
70	138.84	59.72	0.054	44.1	0.08
71	139.34	59.37	0.044	29.4	0.05
72	139.86	59.02	0.034	17.8	0.03
73	140.37	58.67	0.034	17.7	0.03
74	140.90	58.32	0.035	18.0	0.03
75	141.42	57.97	0.036	19.0	0.03
76	141.96	57.63	0.043	28.4	0.05
77	142.50	57.29	0.051	39.5	0.06
78	143.04	56.95	0.059	52.3	0.09
79	143.59	56.62	0.067	66.8	0.11
80	144.14	56.29	0.074	83.0	0.13
81	144.70	55.96	0.082	100.0	0.16
82	145.26	55.63	0.087	113.3	0.18
83	145.83	55.31	0.092	127.2	0.20
84	146.40	54.99	0.097	141.4	0.22
85	146.97	54.67	0.099	148.0	0.23
86	147.55	54.35	0.102	154.7	0.24
87	148.14	54.04	0.104	161.5	0.25
88	148.73	53.72	0.103	159.7	0.24
89	149.32	53.41	0.102	156.8	0.23
90	149.92	53.11	0.101	154.0	0.23
91	150.52	52.80	0.099	145.9	0.22
92	151.13	52.50	0.095	135.4	0.20
93	151.74	52.20	0.091	125.3	0.18
94	152.35	51.90	0.087	113.5	0.16
95	152.97	51.61	0.081	97.9	0.14
96	153.60	51.32	0.075	83.6	0.12