

## **ENGINEERING EXHIBIT**

### **Digital Television Station Application for Minor Modification of Licensed Facility**

prepared for

#### **Gray Television Licensee, LLC**

WECT(DT) Wilmington NC

Facility ID 48666

Ch. 23 550 kW 592 m

*Gray Television Licensee, LLC* (“*Gray*”) is the licensee of digital television station WECT(DT), Channel 23, Facility ID 48666, Wilmington NC. WECT is licensed (file# 0000111584) to operate at 510 kW effective radiated power (“ERP”) with a directional antenna at 590 meters height above average terrain (“HAAT”). *Gray* proposes herein to utilize a replacement antenna and operate WECT at increased ERP of 550 kW at 592 meters HAAT.

The existing WECT broadband panel directional antenna has become deficient and will be replaced with a new antenna of the same style. WECT shares the antenna with stations WSFX-TV Channel 29 and WWAY Channel 24, both Wilmington NC. The replacement antenna, supplied by an alternate manufacturer, has a similar but not exact directional azimuthal pattern as compared to the licensed facility. Manufacturing differences also place the resulting proposed antenna radiation center height above ground level at 588.2 meters, an increase of 1.2 meters above the licensed value. The proposed replacement antenna will be top-mounted in lieu of the existing antenna on the WECT tower structure corresponding to FCC Antenna Structure Registration number 1008242.

The proposed antenna is a horizontally polarized ERI model ETU14U4-HTP40x-24/23/29. *Gray* proposes to operate WECT with an ERP of 550 kW at 592 meters antenna HAAT. The directional antenna’s azimuthal pattern is depicted in Figure 1 and the elevation pattern is supplied in Figure 2.

Figure 3 supplies a map that demonstrates compliance with §73.625(a)(1) regarding coverage of the entire principal community. The proposed facility's predicted population exceeds 95 percent of the baseline facility's population as described in the *Incentive Auction Closing and Channel Reassignment Public Notice* ("CCRPN", DA 17-317, released April 13, 2017).

The proposed facility expands the WECT noise limited service contour ("NLSC") beyond that established by the CCRPN. Interference study per FCC OET Bulletin 69<sup>1</sup> shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby full service and Class A television stations as required by §73.616. The interference study output report is provided as Table 1.

The proposed WECT NLSC encompasses and expands beyond nearly all of the licensed facility's NLSC. Minor NLSC loss areas are created due to the directional pattern variations of the replacement antenna. The NLSC of nearby licensed television stations which overlap the loss areas are provided on Figure 4 to demonstrate the availability of other services. All of the NLSC loss areas are considered "well served" since at least five other licensed television facilities provide NLSC overlap. There are at least eight other NLSC services available throughout all of the loss areas.

The proposed 550 kW ERP exceeds the maximum permitted by §73.622(f)(8) for the proposed antenna HAAT of 592 meters. Section 73.622(f)(5) permits the maximum ERP to be exceeded in order to provide the same geographic coverage area as the largest station within the same market. As demonstrated in Figure 5, the total area within the proposed WECT NLSC is 35,949 square kilometers, which does not exceed the NLSC area of WWAY (37,628 sq. km). Thus, the 550 kW ERP specified herein complies with §73.622(f)(5).

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<sup>1</sup>FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69"). This analysis employed the FCC's current "TVStudy" software with the default application processing template settings, 2 km cell size, and 1.0 km terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC's implementation of TVStudy show excellent correlation.

### **Human Exposure to Radiofrequency Electromagnetic Field (Environmental)**

The proposed operation was evaluated for human exposure to RF energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10), and considering 15 percent antenna relative field in downward elevations (pattern data shows less than 15 percent relative field at angles 10 to 90 degrees below the antenna), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is  $1.2 \mu\text{W}/\text{cm}^2$ , which is 0.3 percent of the general population/uncontrolled maximum permitted exposure limit. This is well below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent.

The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower, or antenna from RF electromagnetic field exposure in excess of FCC guidelines. This exhibit is limited to the evaluation of exposure to RF electromagnetic field.

#### List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Antenna Elevation Pattern
Figure 3	Proposed Coverage Contours
Figure 4	Coverage Contour Comparison – Alternate DTV Services
Figure 5	Coverage Contour Comparison - Maximum ERP per §73.622(f)
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

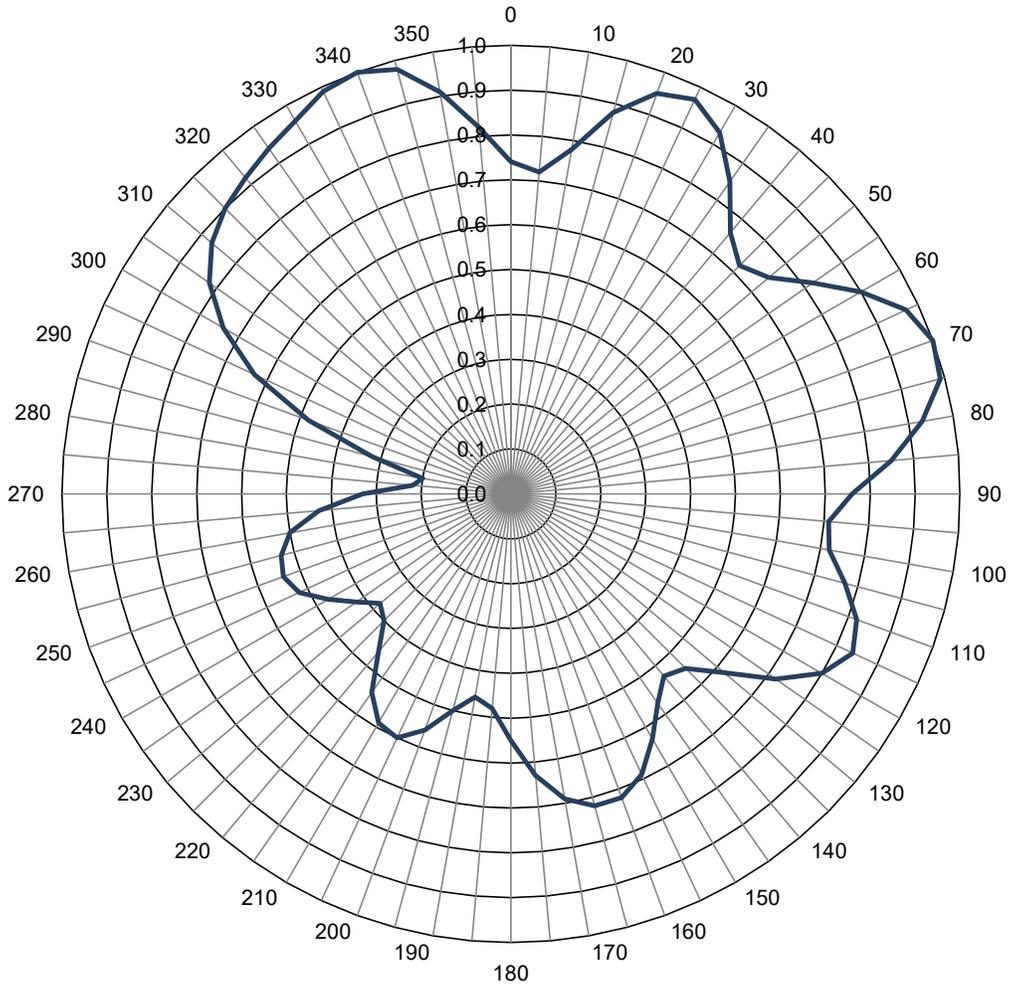
#### **Chesapeake RF Consultants, LLC**

Joseph M. Davis, P.E.                      January 13, 2023  
207 Old Dominion Road                      Yorktown, VA 23692                      703-650-9600

### Azimuth Pattern

Type:	ETUP4Ox-H	Polarization:	Horizontal
Directivity:	1.91 numeric (2.86 dB)	Frequency:	23 (ATSC)
Peak(s) at:		Location:	Wilmington, NC
		NOTE: Pattern shape and directivity may vary with channel and mounting configuration.	

### Relative Field



**Figure 1**  
**Antenna Azimuthal Pattern**  
**WECT(DT) Wilmington NC**  
**Facility ID 48666**  
**Ch. 23 550 kW 592 m**

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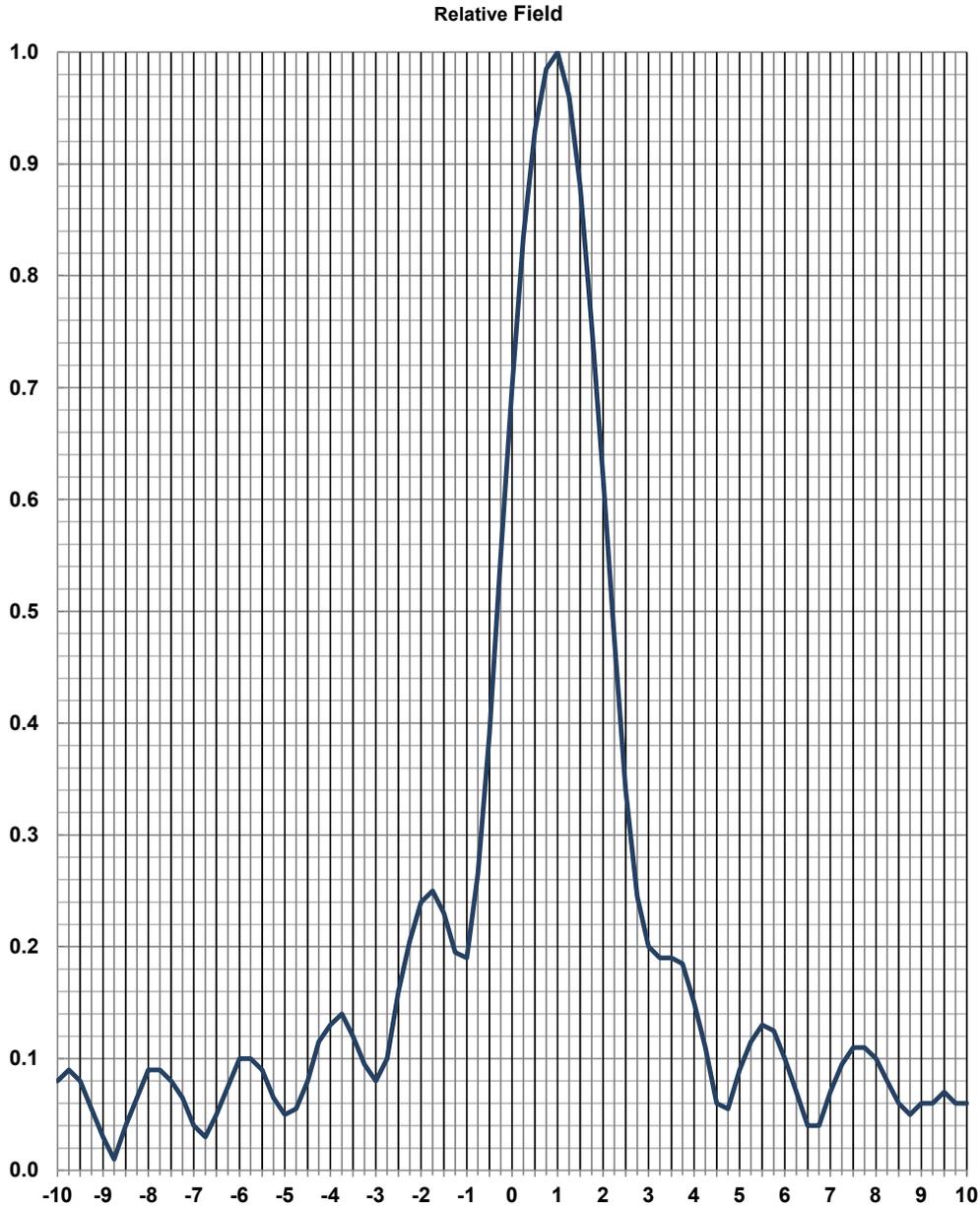
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January, 2023

### Elevation Pattern

Type:	ETU-14U4-H	Polarization:	Horizontal
Directivity:		Frequency:	23 (ATSC)
Main Lobe:	30.44 numeric (14.83 dB)	Location:	Wilmington, NC
Horizontal:	14.92 numeric (11.74 dB)	Beam Tilt:	1.00 degrees



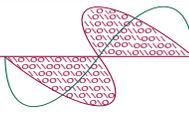
**Figure 2**  
**Antenna Elevation Pattern**  
**WECT(DT) Wilmington NC**  
**Facility ID 48666**  
**Ch. 23 550 kW 592 m**

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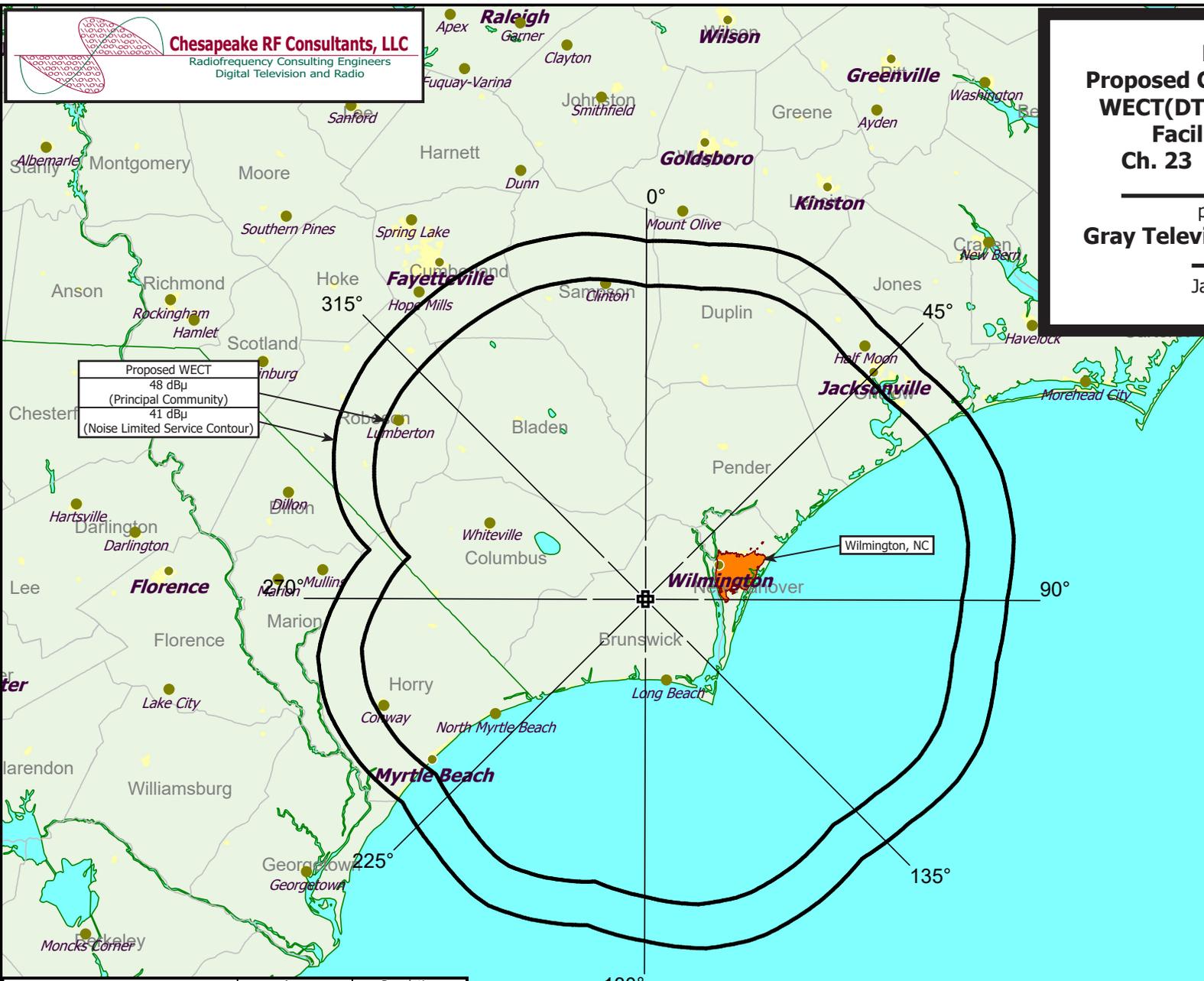
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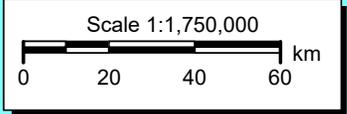
**Figure 3**  
**Proposed Coverage Contours**  
**WECT(DT) Wilmington NC**  
**Facility ID 48666**  
**Ch. 23 550 kW 592 m**

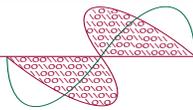
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Proposed WECT
48 dBµ
(Principal Community)
41 dBµ
(Noise Limited Service Contour)

Proposed Digital Coverage	Area (sq. km)	Population (2010 Census)
Within Noise Limited Service Contour	35,949.1	1,093,132
OET Bulletin 69: TVStudy		
Within noise limited contour	37,801.7	1,149,490
Not affected by terrain losses	37,801.7	1,149,490
Lost to all interference	292.7	11,657
Net Interference-Free Service	37,509.0	1,137,833



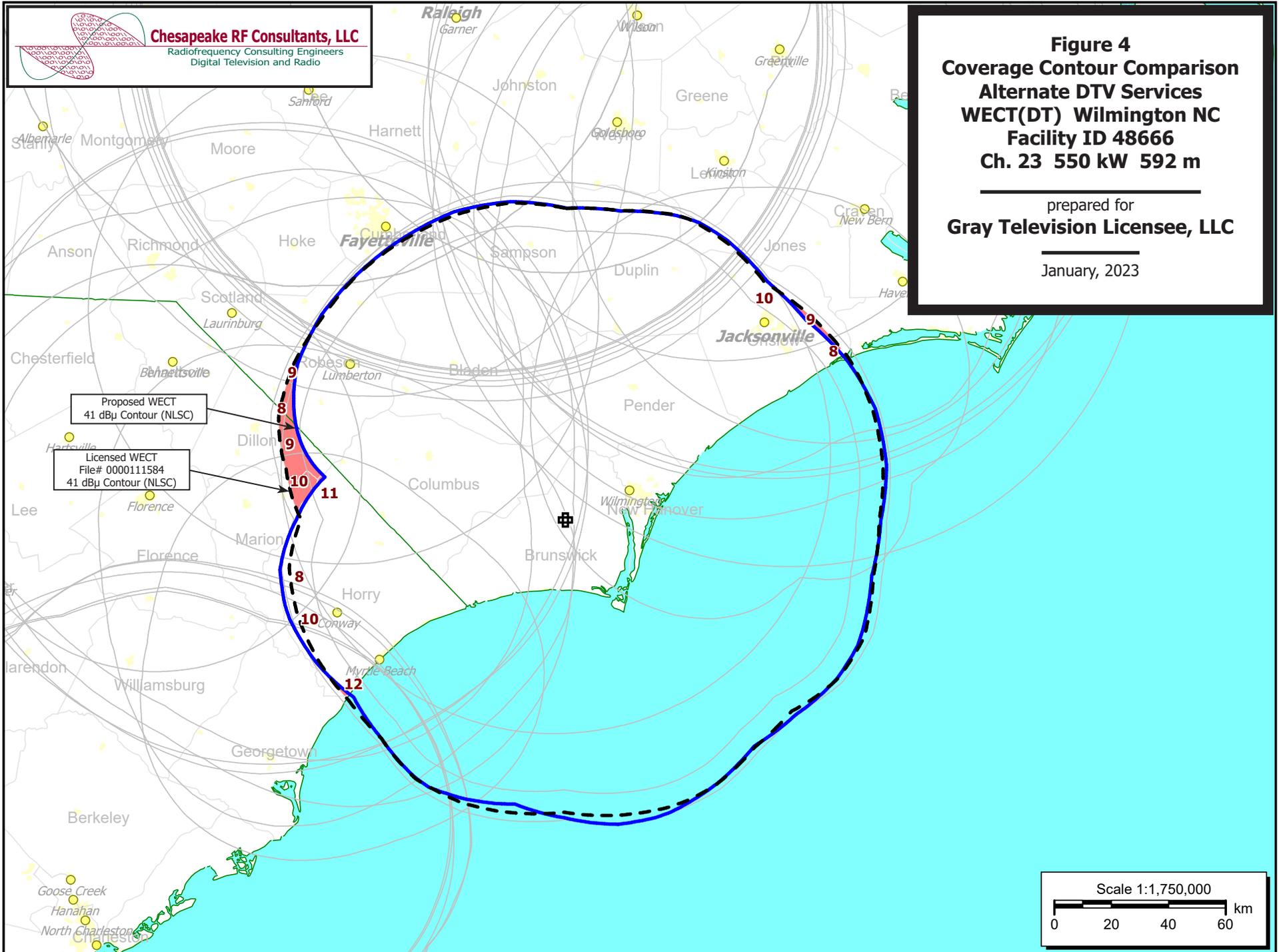


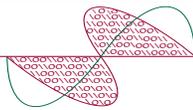
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**Figure 4**  
**Coverage Contour Comparison**  
**Alternate DTV Services**  
**WECT(DT) Wilmington NC**  
**Facility ID 48666**  
**Ch. 23 550 kW 592 m**

prepared for  
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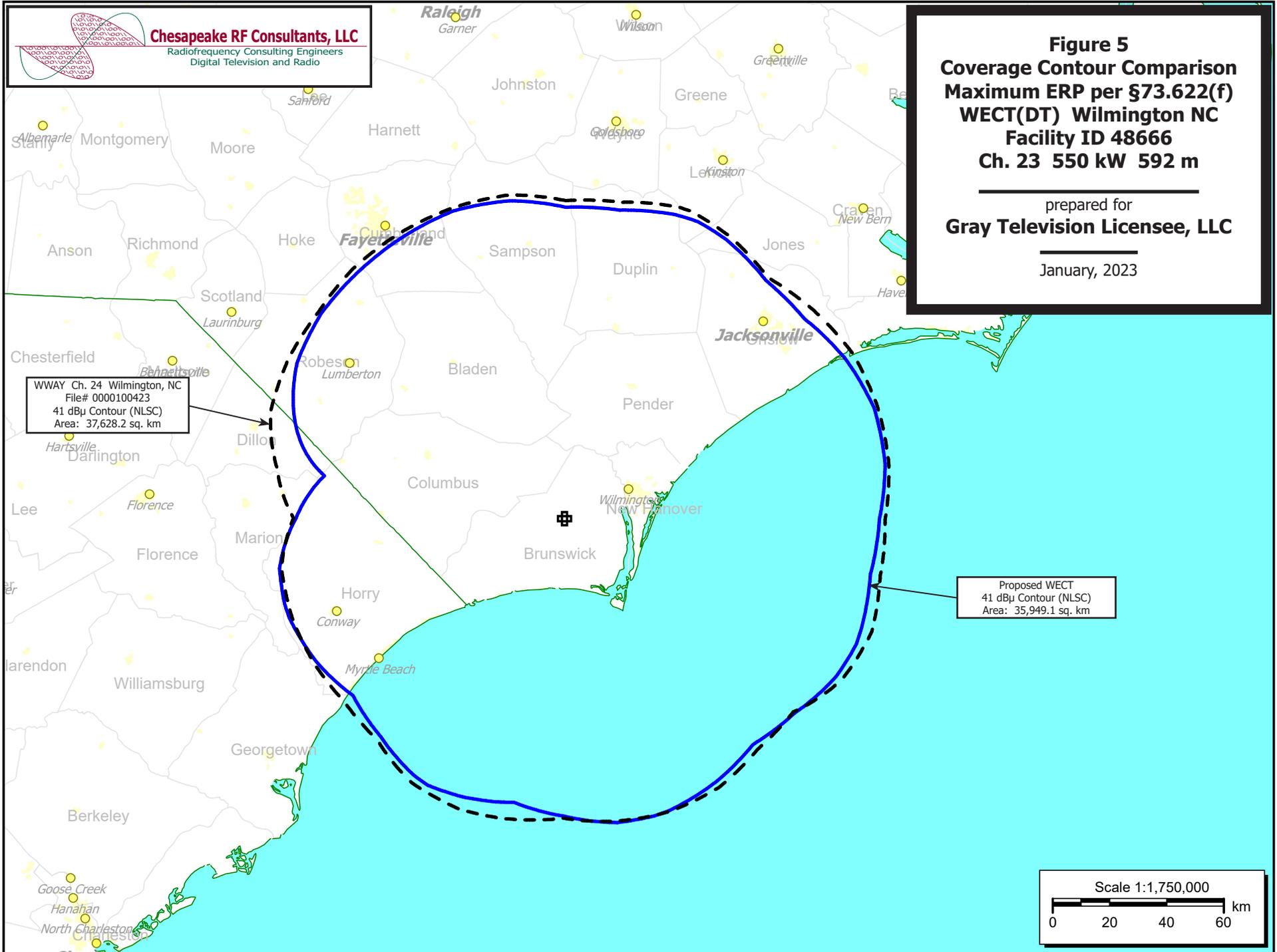


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**Figure 5**  
**Coverage Contour Comparison**  
**Maximum ERP per §73.622(f)**  
**WECT(DT) Wilmington NC**  
**Facility ID 48666**  
**Ch. 23 550 kW 592 m**

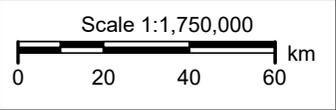
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January, 2023



WWAY Ch. 24 Wilmington, NC  
File# 0000100423  
41 dBμ Contour (NLSC)  
Area: 37,628.2 sq. km

Proposed WECT  
41 dBμ Contour (NLSC)  
Area: 35,949.1 sq. km



**Table 1 WECT TVStudy Analysis of Proposal**  
 (page 1 of 3)



tvstudy v2.2.5 (4uoc83)  
 Database: localhost, Study: WECT ETU 550kW, Model: Longley-Rice  
 Start: 2023.01.11 11:08:04

Study created: 2023.01.11 11:08:04

Study build station data: LMS TV 2023-01-07

Proposal: WECT D23 DT APP WILMINGTON, NC  
 File number: WECT ETU 550kW  
 Facility ID: 48666  
 Station data: User record  
 Record ID: 4810  
 Country: U.S.  
 Zone: II

Search options:  
 Baseline record excluded if station has CP

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
Yes	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	169.5 km
No	WACH	D22	DT	LIC	COLUMBIA, SC	BLANK0000093772	237.0
No	WTOC-TV	D23	DT	CP	SAVANNAH, GA	BLANK0000203704	374.2
Yes	WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	306.2
Yes	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	174.6
No	WITD-CD	D23	DC	LIC	CHESAPEAKE, VA	BLANK0000001500	335.2
No	WTVR-TV	D23	DT	LIC	RICHMOND, VA	BLANK0000185678	379.5
No	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	213.0
No	WWAY	D24	DT	LIC	WILMINGTON, NC	BLANK0000100423	0.0
No	WITV	D24	DT	LIC	CHARLESTON, SC	BLANK0000118279	193.9

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D23  
 Latitude: 34 7 54.00 N (NAD83)  
 Longitude: 78 11 16.00 W  
 Height AMSL: 607.4 m  
 HAAT: 592.2 m  
 Peak ERP: 550 kW  
 Antenna: Ch23 ETU14U4 AZpat 20210304-390-1r1 0.0 deg  
 Elev Pattn: Generic  
 Elec Tilt: 1.00

39.7 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	300 kW	590.9 m	111.8 km
45.0	306	591.3	112.0
90.0	324	599.7	112.9
135.0	168	592.6	106.8
180.0	162	596.6	106.7
225.0	83.9	590.2	100.7
270.0	51.8	588.5	96.6
315.0	426	588.0	114.8

ERP exceeds maximum  
 ERP: 550 kW ERP maximum: 336 kW

Distance to Canadian border: 916.0 km

Distance to Mexican border: 2013.2 km

Conditions at FCC monitoring station: Laurel MD  
 Bearing: 11.9 degrees Distance: 572.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

**Table 1 WECT TVStudy Analysis of Proposal**  
(page 2 of 3)



Bearing: 293.5 degrees Distance: 2476.0 km

Study cell size: 2.00 km  
Profile point spacing: 1.00 km

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

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Interference to BLANK0000125505 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance			
Desired:	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505				
Undesireds:	WECT	D23	DT	BL	WILMINGTON, NC	DTVBL48666	169.5 km			
	WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW	169.5			
	WUNG-TV	D21	DT	LIC	CONCORD, NC	BLANK0000113063	148.8			
	WUNJ-TV	D21	DT	LIC	WILMINGTON, NC	BLANK0000126699	148.9			
	WACH	D22	DT	LIC	COLUMBIA, SC	BLANK0000093772	225.0			
	WCVE-TV	D22	DT	LIC	RICHMOND, VA	BLANK0000112529	254.1			
	WBTV	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	200.7			
	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	44.0			
	Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX					
	37861.3	3,768,817	37432.3	3,748,841	35925.7	3,697,159	35925.7	3,697,159	0.00	0.00
Undesired			Total IX	Unique IX, before	Unique IX, after					
WECT D23 DT BL		79.6	611	0.0	0					
WECT D23 DT APP		119.3	811		0.0	0				
WUNG-TV D21 DT LIC		497.9	27,247	401.5	22,573	401.5	22,573			
WUNJ-TV D21 DT LIC		246.6	1,911	167.0	1,300	127.3	1,100			
WACH D22 DT LIC		203.1	7,427	143.0	4,055	143.0	4,055			
WCVE-TV D22 DT LIC		518.6	14,582	510.6	14,464	510.6	14,464			
WBTV D23 DT LIC		44.4	1,414	4.0	54	4.0	54			
WNGT-CD D23 DC LIC		104.5	3,951	96.5	3,833	96.5	3,833			

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Interference to BLANK0000147971 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance			
Desired:	WBTV	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971				
Undesireds:	WECT	D23	DT	BL	WILMINGTON, NC	DTVBL48666	306.2 km			
	WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW	306.2			
	WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	200.7			
	WACH	D22	DT	LIC	COLUMBIA, SC	BLANK0000093772	144.0			
	WKPT-CD	D22	DC	LIC	KINGSPORT, TN	BLDFTA20120420ACJ	180.5			
	WTOC-TV	D23	DT	CP	SAVANNAH, GA	BLANK0000203704	368.2			
	WKPI-TV	D23	DT	LIC	PIKEVILLE, KY	BLANK0000087418	244.8			
	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	242.3			
	WAPW-CD	D23	DC	LIC	ABINGDON, ETC., VA	BLANK0000116775	173.8			
	WTVR-TV	D23	DT	LIC	RICHMOND, VA	BLANK0000185678	399.7			
	WCNC-TV	D24	DT	LIC	CHARLOTTE, NC	BLANK0000147158	2.4			
	Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX					
	46335.0	4,433,795	44133.5	4,296,893	43046.9	4,262,608	43098.3	4,262,934	-0.12	-0.01
Undesired			Total IX	Unique IX, before	Unique IX, after					
WECT D23 DT BL		340.1	9,342	283.7	7,995					
WECT D23 DT APP		288.8	9,136		232.3	7,669				
WUVC-DT D22 DT LIC		40.4	1,274	8.1	255	8.1	255			
WACH D22 DT LIC		359.0	4,511	287.2	3,039	287.2	3,039			
WKPT-CD D22 DC LIC		4.0	183	0.0	0	0.0	0			
WTOC-TV D23 DT CP		99.7	2,183	23.9	711	23.9	711			
WKPI-TV D23 DT LIC		24.0	557	12.0	170	12.0	170			
WNGT-CD D23 DC LIC		68.5	9,401	12.0	6,373	12.0	6,373			
WAPW-CD D23 DC LIC		28.0	351	20.0	147	20.0	147			
WTVR-TV D23 DT LIC		4.0	1,644	0.0	0	0.0	0			
WCNC-TV D24 DT LIC		295.4	10,625	291.4	10,625	291.4	10,625			

**Table 1 WECT TVStudy Analysis of Proposal**  
 (page 3 of 3)



Interference to BLANK0000143970 LIC scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance			
Desired: WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970				
Undesireds: WECT	D23	DT	BL	WILMINGTON, NC	DTVBL48666	174.6 km			
WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW	174.6			
WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	44.0			
WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	242.3			
WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	42.0			
Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
9489.3	1,689,045	9481.3	1,688,769	9215.7	1,664,720	9195.6	1,663,577	0.22	0.07
Undesired		Total IX		Unique IX, before		Unique IX, after			
WECT D23 DT BL		76.3	3,878	60.1	3,349				
WECT D23 DT APP		100.4	5,094			80.2	4,492		
WUVC-DT D22 DT LIC		161.3	8,338	133.1	5,574	129.0	5,501		
WBTW D23 DT LIC		16.2	700	0.0	0	0.0	0		
WUBX-CD D24 DC LIC		52.1	14,248	44.1	12,362	44.1	12,362		

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 Interference to proposal scenario 1  
 1.01% interference received

Call	Chan	Svc	Status	City, State	File Number	Distance	
Desired: WECT	D23	DT	APP	WILMINGTON, NC	WECT ETU 550kW		
Undesireds: WUVC-DT	D22	DT	LIC	FAYETTEVILLE, NC	BLANK0000125505	169.5 km	
WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	306.2	
WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	174.6	
Service area		Terrain-limited		IX-free		Percent IX	
37801.7	1,149,490	37801.7	1,149,490	37509.0	1,137,833	0.77	1.01
Undesired		Total IX		Unique IX		Prcnt Unique IX	
WUVC-DT D22 DT LIC		27.7	829	0.0	0	0.00	0.00
WBTW D23 DT LIC		7.9	1,514	4.0	1,441	0.01	0.13
WNGT-CD D23 DC LIC		288.7	10,216	261.0	9,387	0.69	0.82

**Channel and  
Facility  
Information**

<b>Section</b>	<b>Question</b>	<b>Response</b>
<b>Proposed Community of License</b>	Facility ID	48666
	State	North Carolina
	City	WILMINGTON
	DTV Channel	23
	Designated Market Area	Wilmington
<b>Facility Type</b>	Facility Type	Commercial
	Station Type	Main
<b>Zone</b>	Zone	2

**Antenna Location  
Data**

Section	Question	Response
<b>Antenna Structure Registration</b>	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1008242
<b>Coordinates (NAD83)</b>	Latitude	34° 07' 54.0" N+
	Longitude	078° 11' 16.0" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	595.6 meters
	Support Structure Height	548.0 meters
	Ground Elevation (AMSL)	19.2 meters
<b>Antenna Data</b>	Height of Radiation Center Above Ground Level	588.2 meters
	Height of Radiation Center Above Average Terrain	592.2 meters
	Height of Radiation Center Above Mean Sea Level	607.4 meters
	Effective Radiated Power	550 kW

**Antenna  
Technical Data**

Section	Question	Response
<b>Antenna Type</b>	Antenna Type	Directional Custom
	Do you have an Antenna ID?	No
	Antenna ID	
<b>Antenna Manufacturer and Model</b>	Manufacturer:	ERI
	Model	ETU14U4-HTP4Ox-24/23/29
	Rotation	0 degrees
	Electrical Beam Tilt	1
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Horizontal
<b>DTV and DTS: Elevation Pattern</b>	Does the proposed antenna propose elevation radiation patterns that vary with azimuth for reasons other than the use of mechanical beam tilt?	No
	Uploaded file for elevation antenna (or radiation) pattern data	

**Directional Antenna Relative Field Values (Pre-rotated Pattern)**

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	0.739	90	0.768	180	0.543	270	0.307
10	0.768	100	0.714	190	0.446	280	0.183
20	0.927	110	0.800	200	0.531	290	0.456
30	0.905	120	0.767	210	0.552	300	0.717
40	0.746	130	0.593	220	0.428	310	0.852
50	0.747	140	0.513	230	0.353	320	0.908
60	0.907	150	0.623	240	0.444	330	0.961
70	0.999	160	0.706	250	0.504	340	1.000
80	0.937	170	0.678	260	0.472	350	0.918

**Additional Azimuths**

Degree	V <sub>A</sub>
253	0.505
24	0.956
207	0.571
163	0.708
113	0.818