

## **ENGINEERING EXHIBIT**

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

**Gray Television Licensee, LLC**  
W18FC-D Florence, SC  
Facility ID 185606  
Ch. 18 4 kW Directional

*Gray Television Licensee, LLC* (“Gray”) is the proposed assignee (file# 0000214777) of digital Low Power Television station W18FC-D, Channel 18, Facility ID 185606, Florence SC. W18FC-D is licensed to operate at 0.2 kW effective radiated power (“ERP”) with a directional antenna (file# 0000177715, granted January 11, 2022). *Gray* proposes herein a minor modification Construction Permit to relocate W18FC-D and to utilize a different directional antenna at increased ERP and antenna height.

As proposed herein, W18FC-D will employ an antenna to be side-mounted on the tower structure associated with FCC Antenna Structure Registration number 1281351, located 33.1 km (20.5 miles) from the licensed site. No change to the overall structure height is proposed.

The proposed antenna is a Dielectric model DLP-4B having horizontal polarization. The proposed ERP is 4 kW using a “full service” out of channel emission mask. A plot of the directional antenna’s azimuthal pattern is supplied in Figure 1. Figure 2 depicts the coverage contour of the proposed facility as well as that of the licensed facility, demonstrating compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69<sup>1</sup> shows that the proposal complies with the FCC’s interference protection requirements toward all digital television, television translator, LPTV, and

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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, 1 km cell size, and 1 km terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC’s implementation of

Class A stations. The results, summarized in Table 1, show that any new interference does not exceed the FCC's interference limits (0.5 percent to full power and Class A stations, and 2.0 percent to secondary stations) to any facility.

### **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 30 percent antenna relative field in downward elevations (antenna elevation pattern data shows 30 percent relative field or less for angles 20-90 degrees below the horizontal), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is  $6.3 \mu\text{W}/\text{cm}^2$ , which is 1.9 percent of the general population/uncontrolled maximum permitted exposure limit. This is 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.

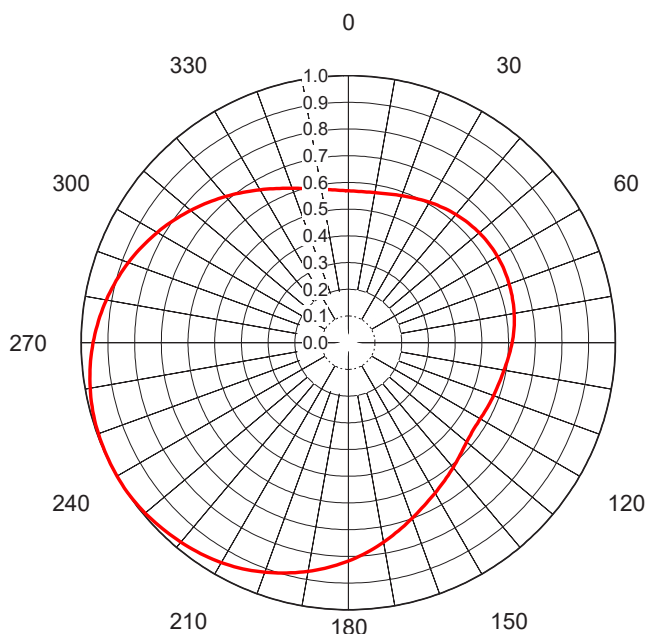
The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power 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. No increase in structure height is proposed.

#### List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Coverage Contour Comparison
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections of FCC Form at Time of Upload

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

Joseph M. Davis, P.E.      May 26, 2023  
207 Old Dominion Road      Yorktown, VA 23692      703-650-9600



## AZIMUTH PATTERN Horizontal Polarization

Proposal No. 20230526jmd  
Date 26-May-23  
Call Letters W18FC-D  
Channel 18  
Frequency 497 MHz  
Antenna Type DLP-4B  
Gain 1.76 (2.45dB)  
Calculated

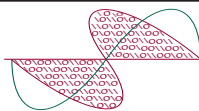
Pattern Number TLP-B-18 Hpol

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.569	36	0.619	72	0.640	108	0.581	144	0.625	180	0.817	216	0.966	252	0.994	288	0.886
1	0.568	37	0.621	73	0.639	109	0.580	145	0.629	181	0.823	217	0.968	253	0.993	289	0.881
2	0.568	38	0.623	74	0.638	110	0.579	146	0.633	182	0.828	218	0.971	254	0.992	290	0.876
3	0.568	39	0.625	75	0.637	111	0.578	147	0.637	183	0.834	219	0.973	255	0.990	291	0.872
4	0.568	40	0.627	76	0.636	112	0.577	148	0.641	184	0.839	220	0.975	256	0.989	292	0.867
5	0.568	41	0.628	77	0.634	113	0.576	149	0.646	185	0.844	221	0.977	257	0.987	293	0.862
6	0.568	42	0.630	78	0.633	114	0.575	150	0.650	186	0.849	222	0.979	258	0.985	294	0.857
7	0.569	43	0.632	79	0.632	115	0.574	151	0.654	187	0.854	223	0.980	259	0.983	295	0.852
8	0.569	44	0.633	80	0.631	116	0.573	152	0.659	188	0.859	224	0.982	260	0.981	296	0.847
9	0.570	45	0.634	81	0.629	117	0.572	153	0.663	189	0.864	225	0.984	261	0.979	297	0.842
10	0.571	46	0.636	82	0.628	118	0.572	154	0.668	190	0.869	226	0.986	262	0.977	298	0.836
11	0.572	47	0.637	83	0.626	119	0.571	155	0.673	191	0.874	227	0.988	263	0.975	299	0.831
12	0.573	48	0.638	84	0.625	120	0.570	156	0.678	192	0.879	228	0.990	264	0.972	300	0.826
13	0.574	49	0.639	85	0.623	121	0.570	157	0.683	193	0.883	229	0.991	265	0.970	301	0.820
14	0.575	50	0.640	86	0.621	122	0.570	158	0.688	194	0.888	230	0.993	266	0.967	302	0.815
15	0.577	51	0.641	87	0.619	123	0.570	159	0.694	195	0.893	231	0.994	267	0.964	303	0.810
16	0.578	52	0.642	88	0.618	124	0.570	160	0.699	196	0.897	232	0.995	268	0.961	304	0.804
17	0.580	53	0.643	89	0.616	125	0.571	161	0.705	197	0.902	233	0.996	269	0.958	305	0.799
18	0.582	54	0.643	90	0.613	126	0.572	162	0.711	198	0.906	234	0.997	270	0.955	306	0.793
19	0.584	55	0.644	91	0.611	127	0.573	163	0.716	199	0.910	235	0.998	271	0.952	307	0.787
20	0.586	56	0.644	92	0.609	128	0.575	164	0.722	200	0.914	236	0.999	272	0.949	308	0.782
21	0.588	57	0.645	93	0.607	129	0.577	165	0.728	201	0.919	237	0.999	273	0.946	309	0.776
22	0.590	58	0.645	94	0.605	130	0.579	166	0.734	202	0.923	238	0.999	274	0.942	310	0.771
23	0.592	59	0.645	95	0.602	131	0.581	167	0.740	203	0.927	239	1.000	275	0.939	311	0.765
24	0.594	60	0.645	96	0.600	132	0.584	168	0.747	204	0.930	240	1.000	276	0.935	312	0.759
25	0.596	61	0.645	97	0.598	133	0.587	169	0.753	205	0.934	241	1.000	277	0.932	313	0.754
26	0.598	62	0.645	98	0.596	134	0.590	170	0.759	206	0.938	242	0.999	278	0.928	314	0.748
27	0.600	63	0.645	99	0.594	135	0.593	171	0.765	207	0.941	243	0.999	279	0.924	315	0.742
28	0.603	64	0.645	100	0.592	136	0.596	172	0.771	208	0.944	244	0.999	280	0.920	316	0.737
29	0.605	65	0.644	101	0.590	137	0.600	173	0.777	209	0.948	245	0.998	281	0.916	317	0.731
30	0.607	66	0.644	102	0.589	138	0.603	174	0.783	210	0.951	246	0.998	282	0.912	318	0.726
31	0.609	67	0.643	103	0.587	139	0.607	175	0.789	211	0.954	247	0.998	283	0.908	319	0.720
32	0.611	68	0.643	104	0.586	140	0.610	176	0.795	212	0.956	248	0.997	284	0.904	320	0.714
33	0.614	69	0.642	105	0.584	141	0.614	177	0.801	213	0.959	249	0.996	285	0.899	321	0.709
34	0.616	70	0.641	106	0.583	142	0.618	178	0.806	214	0.962	250	0.996	286	0.895	322	0.703
35	0.618	71	0.640	107	0.582	143	0.622	179	0.812	215	0.964	251	0.995	287	0.890	323	0.698

**Figure 1**  
**Antenna Azimuthal Pattern**  
**W18FC-D Florence, SC**  
**Facility ID 185606**  
**Ch. 18 4 kW Directional**

prepared for  
**Gray Television Licensee, LLC**

May, 2023

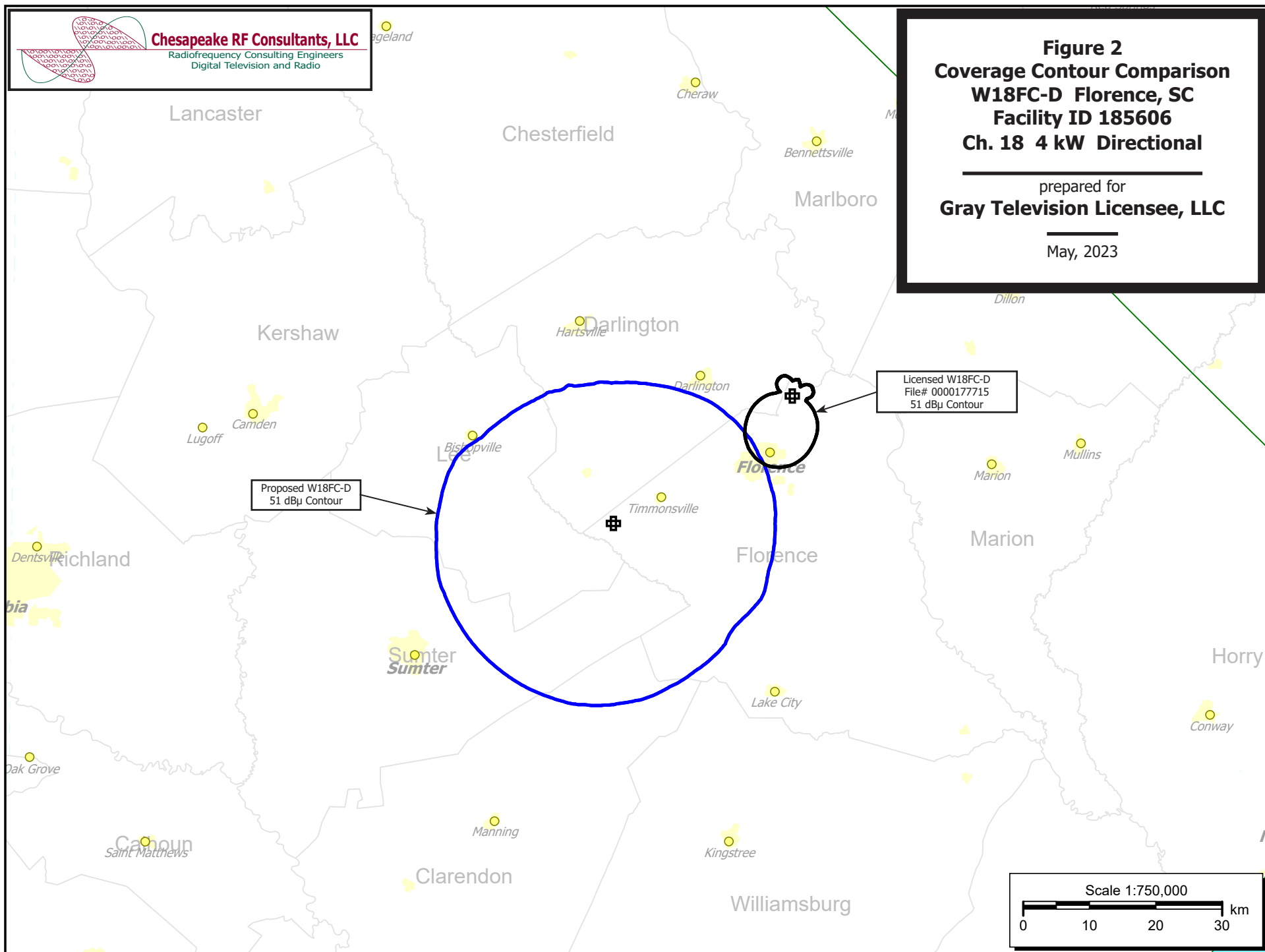


**Chesapeake RF Consultants, LLC**  
Radiofrequency Consulting Engineers  
Digital Television and Radio

**Figure 2**  
**Coverage Contour Comparison**  
**W18FC-D Florence, SC**  
**Facility ID 185606**  
**Ch. 18 4 kW Directional**

prepared for  
**Gray Television Licensee, LLC**

May, 2023



# **Table 1 W18FC-D TVStudy Analysis of Proposal** (page 1 of 3)



tvstudy v2.2.5 (4uoc83)  
Database: localhost, Study: W18FC-D 1281351 DLP-4B, Model: Longley-Rice  
Start: 2023.05.26 11:20:08

Study created: 2023.05.26 11:20:08

Study build station data: LMS TV 2023-05-26

Proposal: W18FC-D D18 LD APP FLORENCE, SC  
File number: W18FC-D 1281351 DLP-4B  
Facility ID: 185606  
Station data: User record  
Record ID: 323  
Country: U.S.

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

Search options:  
Baseline record excluded if station has CP

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	WGAT-LD	D17	LD	LIC	AUGUSTA, GA	BLANK0000214228	185.2 km
No	WCEE-LD	D17	LD	LIC	CHARLOTTE, NC	BLANK0000180361	142.0
No	W17EE-D	D17	LD	LIC	LILESVILLE/WADESBORO, NC	BLANK0000177549	102.5
No	WRAL-TV	D17	DT	LIC	RALEIGH, NC	BLANK0000143682	221.7
No	W17DO-D	D17	LD	LIC	WILMINGTON, NC	BLANK0000178056	168.5
No	WTAT-TV	D17	DT	LIC	CHARLESTON, SC	BLANK0000184941	132.2
No	WHNS	D17	DT	LIC	GREENVILLE, SC	BLANK0000190316	271.7
No	WJXT	D18	DT	LIC	JACKSONVILLE, FL	BLANK0000097950	449.0
No	WUVG-DT	D18	DT	LIC	ATHENS, GA	BLANK0000081094	399.7
No	WIEF-LD	D18	LD	LIC	AUGUSTA, GA	BLANK0000096704	184.3
No	WPGA-LD	D18-	LD	LIC	MACON, GA	BLANK0000163851	360.9
No	WUET-LD	D18	LD	LIC	SAVANNAH, GA	BLANK0000106517	253.4
Yes	WCCB	D18	DT	LIC	CHARLOTTE, NC	BLANK0000097908	145.4
No	W18BB-D	D18	LD	LIC	ELIZABETH CITY, NC	BLDTL20110720ACI	422.3
No	W18EV-D	D18	LD	LIC	NEW BERN, NC	BLANK0000195981	303.6
No	WLFL	D18	DT	LIC	RALEIGH, NC	BLANK0000125309	221.7
No	W18EP-D	D18	LD	LIC	WEAVERVILLE, NC	BLANK0000071711	290.8
No	WQDH-LD	D18	LD	LIC	WILMINGTON, NC	BLANK0000083869	192.3
No	WLCN-CD	D18	DC	LIC	CHARLESTON, SC	BLDTA20090616AA	119.9
No	WLCN-CD	D18	DC	CP	CHARLESTON, SC	BLANK0000205067	143.4
No	W31DY-D	D18	LD	CP	PICKENS, SC	BLANK0000199502	229.2
No	WPXK-TV	D18	DT	LIC	JELICO, TN	BLANK0000081463	414.9
No	WBPI-CD	D19	DC	LIC	AUGUSTA, GA	BLANK0000059661	188.9
No	WUNC-TV	D19	LD	LIC	CHAPEL HILL, NC	BLANK0000115730	221.7
No	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	144.5
No	WYDO	D19	DT	LIC	GREENVILLE, NC	BLANK0000129688	269.6
No	DW19CA	N19-	TX	APP	LUMBERTON, NC	BLTT19961112JH	122.9
No	DDW50EQ-D	D19	LD	APP	LUMBERTON, NC	BLANK0000086353	161.3
No	W19EU-D	D19	LD	LIC	WILMINGTON, NC	BLANK0000195949	161.1
No	W19EU-D	D19	LD	APP	WILMINGTON, NC	BLANK0000202088	161.1
No	WCSC-TV	D19	DT	LIC	CHARLESTON, SC	BLANK0000184937	133.8
No	W19FC-D	D19	LD	LIC	FLORENCE, SC	BLANK0000177716	33.0
No	W19FC-D	D19	LD	CP	FLORENCE, SC	BLANK0000202792	70.6

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D18  
Mask: Full Service  
Latitude: 34 5 56.20 N (NAD83)  
Longitude: 80 1 5.10 W  
Height AMSL: 92.3 m  
HAAT: 0.0 m  
Peak ERP: 4.00 kW  
Antenna: Dielectric-TLP-4B (ID 1010741) 240.0 deg  
Elev Pattn: Generic

**Table 1 W18FC-D TVStudy Analysis of Proposal**  
(page 2 of 3)



Elec Tilt: 1.00

49.1 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	1.30 kW	42.7 m	23.4 km
45.0	1.61	48.5	25.9
90.0	1.50	52.8	26.5
135.0	1.41	54.3	26.5
180.0	2.67	53.4	29.4
225.0	3.87	48.2	30.0
270.0	3.65	44.7	28.8
315.0	2.21	38.9	24.9

Database HAAT does not agree with computed HAAT  
Database HAAT: 0 m Computed HAAT: 48 m

Distance to Canadian border: 867.6 km

Distance to Mexican border: 1856.9 km

Conditions at FCC monitoring station: Powder Springs GA  
Bearing: 267.8 degrees Distance: 434.5 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:  
Bearing: 294.1 degrees Distance: 2323.4 km

No land mobile station failures found

Proposal is not within the Offshore Radio Service protected area

Study cell size: 1.00 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 BLANK0000097908 LIC scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	WCCB	D18	DT	LIC	CHARLOTTE, NC	BLANK0000097908	
Undesireds:	W18FC-D	D18	LD	APP	FLORENCE, SC	W18FC-D 1281351 DLP-4B	145.4 km
	WRAL-TV	D17	DT	LIC	RALEIGH, NC	BLANK0000143682	204.8
	WHNS	D17	DT	LIC	GREENVILLE, SC	BLANK0000190316	177.1
	WUVG-DT	D18	DT	LIC	ATHENS, GA	BLANK0000081094	367.8
	WLFL	D18	DT	LIC	RALEIGH, NC	BLANK0000125309	204.8
	WLCN-CD	D18	DC	LIC	CHARLESTON, SC	BLDTA20090616AAY	255.7
	WPXK-TV	D18	DT	LIC	JELICO, TN	BLANK0000081463	300.9
	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	0.9
Service area		Terrain-limited		IX-free, before		IX-free, after	Percent New IX
33606.6		3,640,752		29730.2		3,360,816	0.16 0.01
Undesired		Total IX		Unique IX, before		Unique IX, after	
W18FC-D D18 LD APP		140.7		1,101		47.2	375
WRAL-TV D17 DT LIC		10.9		249		0.0	0
WHNS D17 DT LIC		218.6		15,977		151.7	11,842
WUVG-DT D18 DT LIC		80.1		4,098		30.1	1,336
WLFL D18 DT LIC		2502.4		189,767		2267.0	179,382
WPXK-TV D18 DT LIC		5.0		762		4.0	762
WSOC-TV D19 DT LIC		303.6		15,484		206.5	7,393

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Interference to BLANK0000097908 LIC scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	WCCB	D18	DT	LIC	CHARLOTTE, NC	BLANK0000097908	

**Table 1 W18FC-D TVStudy Analysis of Proposal**  
(page 3 of 3)



Undesireds:	W18FC-D	D18	LD	APP	FLORENCE, SC	W18FC-D 1281351 DLP-4B	145.4 km
	WRAL-TV	D17	DT	LIC	RALEIGH, NC	BLANK0000143682	204.8
	WHNS	D17	DT	LIC	GREENVILLE, SC	BLANK0000190316	177.1
	WUVG-DT	D18	DT	LIC	ATHENS, GA	BLANK0000081094	367.8
	WLFL	D18	DT	LIC	RALEIGH, NC	BLANK0000125309	204.8
	WLCN-CD	D18	DC	CP	CHARLESTON, SC	BLANK0000205067	284.5
	WPXK-TV	D18	DT	LIC	JELICO, TN	BLANK0000081463	300.9
	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	0.9

Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX
33606.6 3,640,752	32655.8 3,574,377	29728.1 3,361,168	29682.9 3,360,816	0.15 0.01

Undesired	Total IX	Unique IX, before	Unique IX, after
W18FC-D D18 LD APP	140.7 1,101	45.2 352	
WRAL-TV D17 DT LIC	10.9 249	0.0 0	
WHNS D17 DT LIC	218.6 15,977	152.7 11,842	
WUVG-DT D18 DT LIC	80.1 4,098	30.1 1,336	
WLFL D18 DT LIC	2502.4 189,767	2348.4 180,034	
WLCN-CD D18 DC CP	3.0 23	2.0 23	
WPXK-TV D18 DT LIC	5.0 762	4.0 762	
WSOC-TV D19 DT LIC	303.6 15,484	208.5 7,393	

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Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W18FC-D	D18	LD	APP	FLORENCE, SC	W18FC-D 1281351 DLP-4B	
Undesireds:	WLCN-CD	D18	DC	LIC	CHARLESTON, SC	BLDTA20090616AAY	119.9 km
	W19FC-D	D19	LD	LIC	FLORENCE, SC	BLANK0000177716	33.0

Service area	Terrain-limited	IX-free	Percent IX
2306.7 120,858	2306.7 120,858	2306.7 120,858	0.00 0.00

**Channel and  
Facility  
Information**

Section	Question	Response
Facility ID	185606	
State	South Carolina	
City	FLORENCE	
LPD Channel	18	



Antenna Location  
Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1281351
Coordinates (NAD83)	Latitude	34° 05' 56.2" N+
	Longitude	080° 01' 05.1" W-
	Structure Type	LTOWER-Lattice Tower
	Overall Structure Height	78.7 meters
	Support Structure Height	76.2 meters
	Ground Elevation (AMSL)	46.6 meters
Antenna Data	Height of Radiation Center Above Ground Level	45.7 meters
	Height of Radiation Center Above Mean Sea Level	92.3 meters
	Effective Radiated Power	4 kW

Antenna  
Technical Data

Section	Question	Response
Antenna Type	Antenna Type	Directional Custom
	Do you have an Antenna ID?	Yes
	Antenna ID	1010865
Antenna Manufacturer and Model	Manufacturer:	Dielectric
	Model	DLP-4B
	Rotation	240 degrees
	Electrical Beam Tilt	1.0
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Horizontal
Elevation Radiation Pattern	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	
	Out-of-Channel Emission Mask:	Full Service

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	1.000	90	0.661	180	0.645	270	0.650
10	0.996	100	0.615	190	0.641	280	0.699
20	0.981	110	0.583	200	0.631	290	0.759
30	0.955	120	0.569	210	0.613	300	0.817
40	0.920	130	0.571	220	0.592	310	0.869
50	0.876	140	0.586	230	0.579	320	0.914
60	0.826	150	0.607	240	0.570	330	0.951
70	0.771	160	0.627	250	0.579	340	0.975
80	0.714	170	0.640	260	0.610	350	0.993

Additional Azimuths

Degree	V <sub>A</sub>
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