

ENGINEERING EXHIBIT

Digital Low Power Television Station Application for Minor Modification of Construction Permit prepared for

Gray Television Licensee, LLC
W19FC-D Florence, SC
Facility ID 185607
Ch. 19 15 kW Directional

Gray Television Licensee, LLC (“Gray”) is the licensee of digital Low Power Television station W19FC-D, Channel 19, Facility ID 185607, Florence SC. W19FC-D is licensed to operate at 0.2 kW effective radiated power (“ERP”) with a directional antenna (file# 0000177716, granted December 30, 2021). A Construction Permit (“CP” file# 0000244816) authorizes relocation of W19FC-D and use of an alternate directional antenna at 15 kW ERP. *Gray* herein seeks a minor modification of the CP to specify increased antenna height.

As with the current CP, W19FC-D will employ a new antenna to be side-mounted on the tower structure associated with FCC Antenna Structure Registration number 1046062, located 36.5 km (22.7 miles) from the licensed site. No change to the overall structure height is proposed.

The proposed antenna is a Dielectric model DLP-12B having horizontal polarization. The proposed ERP is 15 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 69¹ shows that the proposal complies with the FCC’s interference protection requirements toward all digital television, television translator, LPTV, and

¹FCC 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 facility 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 20 percent antenna relative field in downward elevations (pattern data shows 20 percent or less relative field at angles 10 to 90 degrees below the antenna), the calculated power density attributable to the proposed facility at locations near the transmitter site at a height of two meters AGL is $31.1 \mu\text{W}/\text{cm}^2$, which is 9.3 percent of the general population / uncontrolled maximum permissible exposure limit.

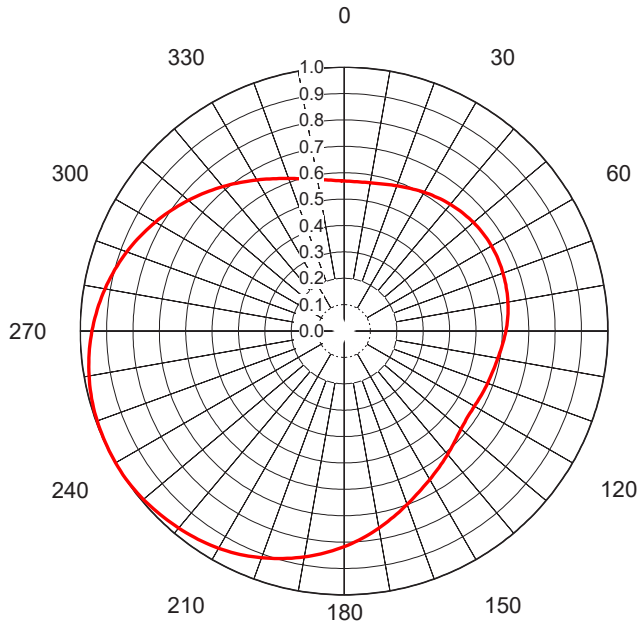
The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation 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 30, 2024	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600



AZIMUTH PATTERN Horizontal Polarization

Proposal No. **20240515jmd**
Date **15-May-24**
Call Letters **W19FC-D**
Channel **19**
Frequency **503 MHz**
Antenna Type **DLP-12B**
Gain **1.76 (2.45dB)**
Calculated

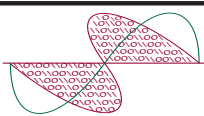
Pattern Number **TLP-B-19 Hpol**

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

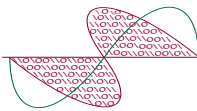
Figure 1
Antenna Azimuthal Pattern
W19FC-D Florence, SC
Facility ID 185607
Ch. 19 15 kW Directional

prepared for
Gray Television Licensee, LLC

May, 2024



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



Chesapeake RF Consultants, LLC
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Figure 2
Coverage Contour Comparison
W19FC-D Florence, SC
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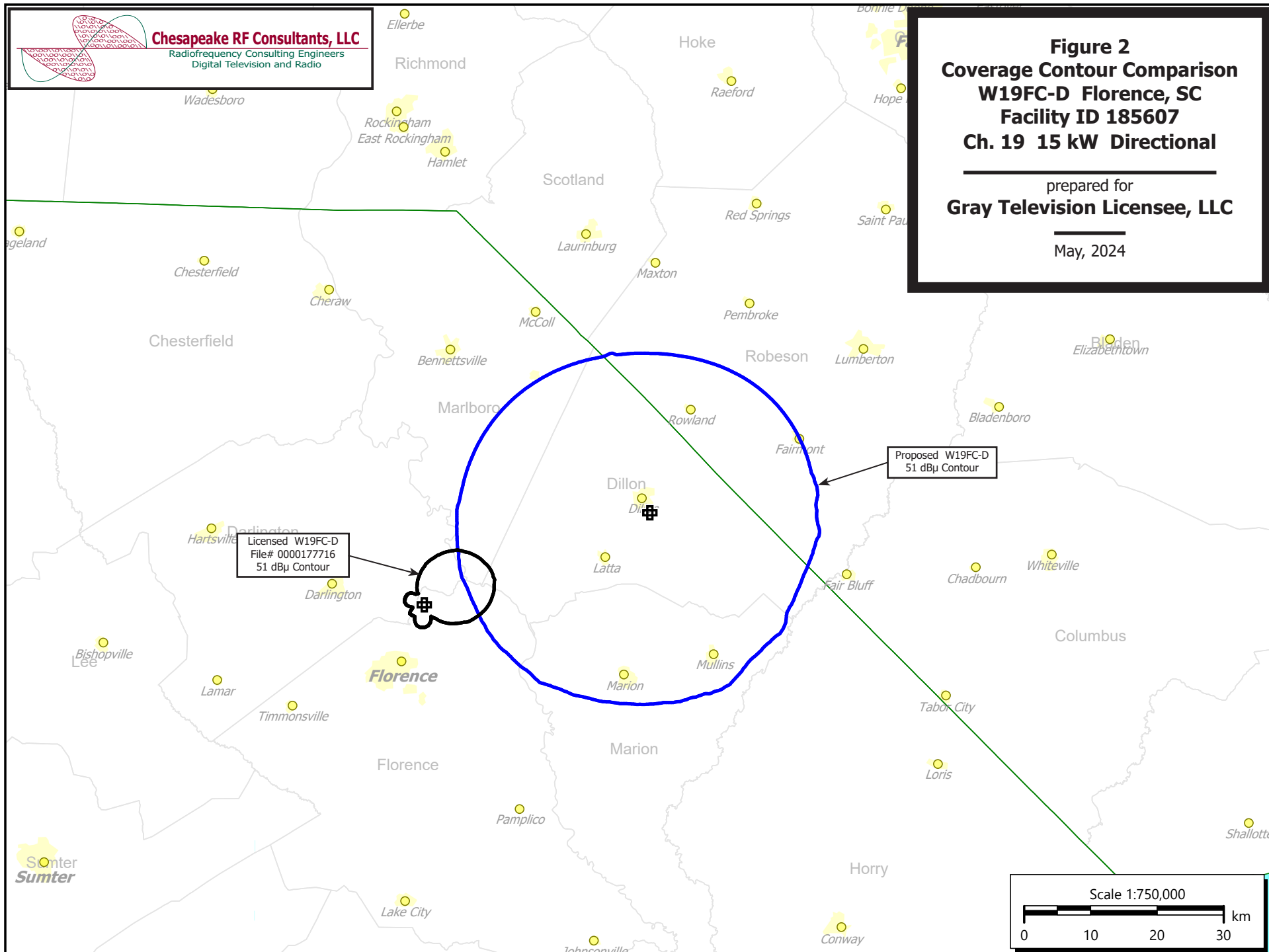


Table 1 W19FC-D TVStudy Analysis of Proposal (page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: W19FC-D 1046062 incr, Model: Longley-Rice
Start: 2024.05.30 13:38:17

Study created: 2024.05.30 13:38:17

Study build station data: LMS TV 2024-05-30

Proposal: W19FC-D D19 LD APP FLORENCE, SC
File number: W19FC-D 1046062 incr
Facility ID: 185607
Station data: User record
Record ID: 406
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	WCCB	D18	DT	LIC	CHARLOTTE, NC	BLANK0000097908	158.5 km
No	WLFL	D18	DT	LIC	RALEIGH, NC	BLANK00000125309	160.9
No	WQDH-LD	D18	LD	LIC	WILMINGTON, NC	BLANK0000083869	133.3
No	WLCN-CD	D18	DC	LIC	CHARLESTON, SC	BLANK00000219781	180.9
No	W18FC-D	D18	LD	LIC	FLORENCE, SC	BLANK00000222338	69.0
No	WANF	D19	DT	LIC	ATLANTA, GA	BLANK00000205000	463.0
No	WBPI-CD	D19	DC	LIC	AUGUSTA, GA	BLANK0000059661	257.3
No	W19DN-D	D19	LD	LIC	MACON, GA	BLANK00000179078	429.9
No	WUNC-TV	D19	LD	LIC	CHAPEL HILL, NC	BLANK00000115730	160.9
Yes	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK00000146857	157.5
No	WYDO	D19	DT	LIC	GREENVILLE, NC	BLANK00000129688	200.7
Yes	DDW50EQ-D	D19	LD	APP	LUMBERTON, NC	BLANK0000086353	107.5
No	WGSR-LD	D19	LD	LIC	REIDSVILLE, NC	BLANK0000072219	220.0
No	W19EU-D	D19	LD	LIC	WILMINGTON, NC	BLANK00000195949	98.7
No	W19EU-D	D19	LD	APP	WILMINGTON, NC	BLANK00000202088	98.7
No	DWLOW-LP	N19-	TX	APP	BEAUFORT, SC	BLTT20000302AAU	256.2
Yes	WCSC-TV	D19	DT	LIC	CHARLESTON, SC	BLANK00000184937	166.6
No	WKPZ-CD	D19	DC	LIC	KINGSPORT, TN	BLANK00000001597	376.1
No	WZBJ-CD	D19	DC	LIC	LYNCHBURG, VA	BLANK00000233374	329.8
No	WAVY-TV	D19	DT	LIC	PORTSMOUTH, VA	BLANK00000125371	372.5
No	WUNC-TV	D20	DT	LIC	CHAPEL HILL, NC	BLANK00000216258	164.3
No	WDMC-LD	D20	LD	LIC	CHARLOTTE, NC	BLANK00000164588	154.0
No	W20EY-D	D20	LD	LIC	WILMINGTON, NC	BLANK00000242927	132.1
No	WCBD-TV	D20	DT	LIC	CHARLESTON, SC	BLANK00000184909	164.9

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D19
Mask: Full Service
Latitude: 34 23 48.30 N (NAD83)
Longitude: 79 21 30.70 W
Height AMSL: 64.8 m
HAAT: 0.0 m
Peak ERP: 15.0 kW
Antenna: DIE TLP-B 240.0 deg
Elev Pattn: Generic
Elec Tilt: 1.00

49.3 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	4.86 kW	25.9 m	26.0 km
45.0	6.02	24.6	27.0
90.0	5.64	31.3	26.9
135.0	5.30	37.2	28.4
180.0	10.0	34.8	30.6

Table 1 W19FC-D TVStudy Analysis of Proposal
(page 2 of 3)



225.0	14.5	33.6	31.9
270.0	13.7	31.0	30.8
315.0	8.27	22.6	28.4

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 30 m

Distance to Canadian border: 851.6 km

Distance to Mexican border: 1925.7 km

Conditions at FCC monitoring station: Powder Springs GA
Bearing: 264.6 degrees Distance: 497.1 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 293.2 degrees Distance: 2365.6 km

No land mobile station failures found

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%

Interference to BLANK0000146857 LIC scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	
Undesireds:	W19FC-D	D19	LD	APP	FLORENCE, SC	W19FC-D 1046062 incr	157.5 km
	WCCB	D18	DT	LIC	CHARLOTTE, NC	BLANK0000097908	0.9
	WLFL	D18	DT	LIC	RALEIGH, NC	BLANK0000125309	204.3
	WANF	D19	DT	LIC	ATLANTA, GA	BLANK0000205000	368.1
	WBPI-CD	D19	DC	LIC	AUGUSTA, GA	BLANK0000059661	223.7
	WYDO	D19	DT	LIC	GREENVILLE, NC	BLANK0000129688	308.5
	WCSC-TV	D19	DT	LIC	CHARLESTON, SC	BLANK0000184937	276.4
	WZBJ-CD	D19	DC	LIC	LYNCHBURG, VA	BLANK0000233374	272.2
	WUNF-TV	D20	DD	LIC	ASHEVILLE, NC	BLANK0000093577	165.5
	WUNC-TV	D20	DT	LIC	CHAPEL HILL, NC	BLANK0000216258	156.3
	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	35316.3	3,711,440	34337.8	3,645,461	32590.9	3,546,140	32385.2 3,535,063 0.63 0.31

Undesired	Total IX	Unique IX, before	Unique IX, after
W19FC-D D19 LD APP	385.4	14,618	205.7 11,077
WCCB D18 DT LIC	99.0	8,760	77.1 6,542
WLFL D18 DT LIC	6.0	299	1.0 106
WANF D19 DT LIC	93.1	3,963	22.0 886
WBPI-CD D19 DC LIC	58.2	1,855	10.1 91
WYDO D19 DT LIC	383.1	22,447	96.0 6,025
WCSC-TV D19 DT LIC	558.6	8,055	424.4 4,728
WZBJ-CD D19 DC LIC	12.1	3,754	2.0 664
WUNF-TV D20 DD LIC	374.3	22,414	323.4 19,627
WUNC-TV D20 DT LIC	630.7	54,535	398.8 39,206

Interference to BLANK0000086353 APP scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	DDW50EQ-D	D19	LD	APP	LUMBERTON, NC	BLANK0000086353	
Undesireds:	W19FC-D	D19	LD	APP	FLORENCE, SC	W19FC-D 1046062 incr	107.5 km
	WLFL	D18	DT	LIC	RALEIGH, NC	BLANK0000125309	64.1
	WUNC-TV	D19	LD	LIC	CHAPEL HILL, NC	BLANK0000115730	64.1
	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	147.3
	WYDO	D19	DT	LIC	GREENVILLE, NC	BLANK0000129688	162.9
	W19EU-D	D19	LD	LIC	WILMINGTON, NC	BLANK0000195949	136.0

Table 1 W19FC-D TVStudy Analysis of Proposal
(page 3 of 3)



	WCSC-TV	D19	DT	LIC	CHARLESTON, SC	BLANK0000184937	274.2		
	WAVY-TV	D19	DT	LIC	PORTSMOUTH, VA	BLANK0000125371	285.2		
	WUNC-TV	D20	DT	LIC	CHAPEL HILL, NC	BLANK0000216258	58.5		
Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
3717.2	235,894	3702.3	235,874	2965.8	198,851	2965.8	198,851	0.00	0.00
Undesired				Total IX	Unique IX, before		Unique IX, after		
W19FC-D	D19	LD	APP	1.0	0	0.0	0		
WLFL	D18	DT	LIC	222.7	16,463	16.9	2,352	16.9	2,352
WUNC-TV	D19	LD	LIC	255.1	18,245	89.4	9,264	89.4	9,264
WSOC-TV	D19	DT	LIC	266.8	18,605	75.7	1,975	75.7	1,975
WYDO	D19	DT	LIC	181.2	12,463	29.9	1,900	29.9	1,900
WCSC-TV	D19	DT	LIC	2.0	0	0.0	0	0.0	0
WAVY-TV	D19	DT	LIC	1.0	814	0.0	0	0.0	0
WUNC-TV	D20	DT	LIC	371.3	10,368	172.7	2,353	172.7	2,353

Interference to BLANK0000184937 LIC scenario 1									
Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance		
	WCSC-TV	D19	DT	LIC	CHARLESTON, SC	BLANK0000184937			
Undesireds:	W19FC-D	D19	LD	APP	FLORENCE, SC	W19FC-D 1046062 incr	166.6 km		
	WBPI-CD	D19	DC	LIC	AUGUSTA, GA	BLANK0000059661	218.4		
	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	276.4		
	WCBD-TV	D20	DT	LIC	CHARLESTON, SC	BLANK0000184909	1.8		
Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
34170.8	1,028,539	34170.8	1,028,539	34133.2	1,028,258	34120.3	1,027,791	0.04	0.05
Undesired				Total IX	Unique IX, before		Unique IX, after		
W19FC-D	D19	LD	APP	18.8	471	12.8	467		
WBPI-CD	D19	DC	LIC	1.0	0	0.0	0		
WSOC-TV	D19	DT	LIC	26.7	132	25.7	132	20.8	128
WCBD-TV	D20	DT	LIC	10.9	149	10.9	149	10.9	149

Interference to proposal scenario 1									
Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance		
	W19FC-D	D19	LD	APP	FLORENCE, SC	W19FC-D 1046062 incr			
Undesireds:	WSOC-TV	D19	DT	LIC	CHARLOTTE, NC	BLANK0000146857	157.5 km		
	W19EU-D	D19	LD	LIC	WILMINGTON, NC	BLANK0000195949	98.7		
	WCSC-TV	D19	DT	LIC	CHARLESTON, SC	BLANK0000184937	166.6		
Service area		Terrain-limited		IX-free		Percent IX			
2617.0	75,818	2617.0	75,818	2514.4	75,219	3.92	0.79		
Undesired				Total IX	Unique IX		Prcnt Unique IX		
WSOC-TV	D19	DT	LIC	97.7	543	97.7	543	3.74	0.72
WCSC-TV	D19	DT	LIC	4.9	56	4.9	56	0.19	0.07

**Channel and
Facility
Information**

Section	Question	Response
Facility ID	185607	
State	South Carolina	
City	FLORENCE	
LPD Channel	19	

Antenna Location
Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1046062
Coordinates (NAD83)	Latitude	34° 23' 48.3" N+
	Longitude	079° 21' 30.7" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	72.5 meters
	Support Structure Height	68.6 meters
	Ground Elevation (AMSL)	37.4 meters
Antenna Data	Height of Radiation Center Above Ground Level	27.4 meters
	Height of Radiation Center Above Mean Sea Level	64.8 meters
	Effective Radiated Power	15 kW

Antenna
Technical Data

Section	Question	Response
Antenna Type	Antenna Type	Directional Custom
	Do you have an Antenna ID?	Yes
	Antenna ID	1011021
Antenna Manufacturer and Model	Manufacturer:	Dielectric
	Model	DLP-12B
	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 _A
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