

ENGINEERING EXHIBIT

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

Gray Television Licensee, LLC
W15ES-D Myrtle Beach, SC
Facility ID 185605
Ch. 15 15 kW Directional

Gray Television Licensee, LLC (“Gray”) is the licensee of digital Low Power Television station W15ES-D, Channel 15, Facility ID 185605, Myrtle Beach SC. W15ES-D is licensed to operate at 0.2 kW effective radiated power (“ERP”) with a directional antenna (file# 0000194110). *Gray* herein seeks a minor modification Construction Permit to relocate W15ES-D and to utilize a different directional antenna pattern at increased power and antenna height.

The proposed facility will employ a new antenna to be side-mounted on the tower structure associated with FCC Antenna Structure Registration number 1038068, located 28.3 km (17.6 miles) from the licensed site. No change to the overall structure height is proposed.

The proposed antenna is a Dielectric model TLP-8B/VP having elliptical polarization. The proposed ERP is 15 kW horizontally polarized and 4.5 kW vertically polarized 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. Since the proposed 51 dBμ contour encompasses that of the licensed facility, no service loss area will be created. Considerable service improvement will result as the population within the 51 dBμ contour increases to 132,865 persons (2010 census), which is 414 percent of the 32,097 persons within the licensed W15ES-D facility’s 51 dBμ contour.

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 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 25 percent antenna relative field in downward elevations (pattern data shows 25 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 above ground level is $3.3 \mu\text{W}/\text{cm}^2$, which is 1.0 percent of the general population / uncontrolled maximum permissible 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.

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 TVStudy show excellent correlation.

Engineering Exhibit
Gray Television Licensee, LLC (W15ES-D)
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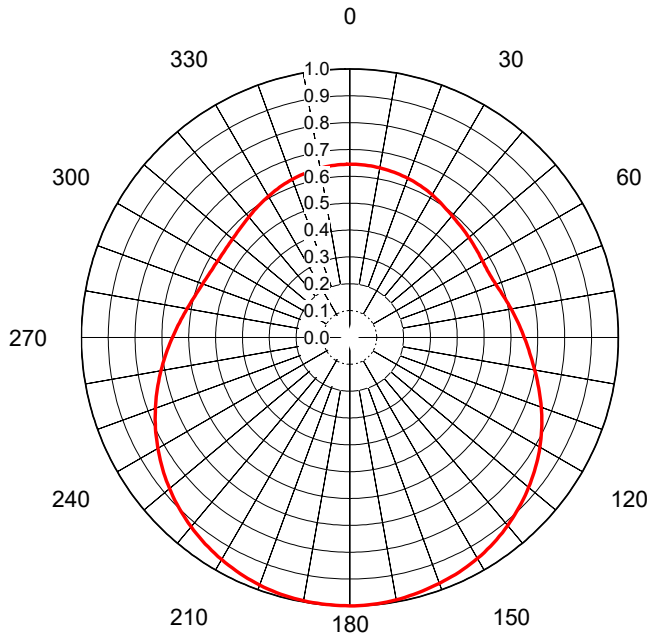


List of Attachments

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.	August 30, 2022	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600



AZIMUTH PATTERN Horizontal Polarization

Proposal No. **20220808jmd**
Date **8-Aug-22**
Call Letters **W15ES-D**
Channel **15**
Frequency **479 MHz**
Antenna Type **TLP-8B/VP**
Gain **1.76 (2.45dB)**
Calculated

Pattern Number **TLP-B-15 Hpol**

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.645	36	0.600	72	0.584	108	0.747	144	0.930	180	1.000	216	0.935	252	0.759	288	0.589
1	0.645	37	0.598	73	0.587	109	0.753	145	0.934	181	1.000	217	0.932	253	0.754	289	0.586
2	0.645	38	0.596	74	0.590	110	0.759	146	0.938	182	0.999	218	0.928	254	0.748	290	0.583
3	0.645	39	0.594	75	0.593	111	0.765	147	0.941	183	0.999	219	0.924	255	0.742	291	0.581
4	0.645	40	0.592	76	0.596	112	0.771	148	0.944	184	0.999	220	0.920	256	0.737	292	0.579
5	0.644	41	0.590	77	0.600	113	0.777	149	0.948	185	0.998	221	0.916	257	0.731	293	0.577
6	0.644	42	0.589	78	0.603	114	0.783	150	0.951	186	0.998	222	0.912	258	0.726	294	0.575
7	0.643	43	0.587	79	0.607	115	0.789	151	0.954	187	0.998	223	0.908	259	0.720	295	0.574
8	0.643	44	0.586	80	0.610	116	0.795	152	0.956	188	0.997	224	0.904	260	0.714	296	0.573
9	0.642	45	0.584	81	0.614	117	0.801	153	0.959	189	0.996	225	0.899	261	0.709	297	0.571
10	0.641	46	0.583	82	0.618	118	0.806	154	0.962	190	0.996	226	0.895	262	0.703	298	0.570
11	0.640	47	0.582	83	0.622	119	0.812	155	0.964	191	0.995	227	0.890	263	0.698	299	0.569
12	0.640	48	0.581	84	0.625	120	0.817	156	0.966	192	0.994	228	0.886	264	0.692	300	0.569
13	0.639	49	0.580	85	0.629	121	0.823	157	0.968	193	0.993	229	0.881	265	0.687	301	0.568
14	0.638	50	0.579	86	0.633	122	0.828	158	0.971	194	0.992	230	0.876	266	0.682	302	0.568
15	0.637	51	0.578	87	0.637	123	0.834	159	0.973	195	0.990	231	0.872	267	0.676	303	0.568
16	0.636	52	0.577	88	0.641	124	0.839	160	0.975	196	0.989	232	0.867	268	0.671	304	0.568
17	0.634	53	0.576	89	0.646	125	0.844	161	0.977	197	0.987	233	0.862	269	0.666	305	0.568
18	0.633	54	0.575	90	0.650	126	0.849	162	0.979	198	0.985	234	0.857	270	0.661	306	0.568
19	0.632	55	0.574	91	0.654	127	0.854	163	0.980	199	0.983	235	0.852	271	0.656	307	0.569
20	0.631	56	0.573	92	0.659	128	0.859	164	0.982	200	0.981	236	0.847	272	0.651	308	0.569
21	0.629	57	0.572	93	0.663	129	0.864	165	0.984	201	0.979	237	0.842	273	0.646	309	0.570
22	0.628	58	0.572	94	0.668	130	0.869	166	0.986	202	0.977	238	0.836	274	0.641	310	0.571
23	0.626	59	0.571	95	0.673	131	0.874	167	0.988	203	0.975	239	0.831	275	0.637	311	0.572
24	0.625	60	0.570	96	0.678	132	0.879	168	0.990	204	0.972	240	0.826	276	0.632	312	0.573
25	0.623	61	0.570	97	0.683	133	0.883	169	0.991	205	0.970	241	0.820	277	0.628	313	0.574
26	0.621	62	0.570	98	0.688	134	0.888	170	0.993	206	0.967	242	0.815	278	0.624	314	0.575
27	0.619	63	0.570	99	0.694	135	0.893	171	0.994	207	0.964	243	0.810	279	0.619	315	0.577
28	0.618	64	0.570	100	0.699	136	0.897	172	0.995	208	0.961	244	0.804	280	0.615	316	0.578
29	0.616	65	0.571	101	0.705	137	0.902	173	0.996	209	0.958	245	0.799	281	0.612	317	0.580
30	0.613	66	0.572	102	0.711	138	0.906	174	0.997	210	0.955	246	0.793	282	0.608	318	0.582
31	0.611	67	0.573	103	0.716	139	0.910	175	0.998	211	0.952	247	0.787	283	0.604	319	0.584
32	0.609	68	0.575	104	0.722	140	0.914	176	0.999	212	0.949	248	0.782	284	0.601	320	0.586
33	0.607	69	0.577	105	0.728	141	0.919	177	0.999	213	0.946	249	0.776	285	0.597	321	0.588
34	0.605	70	0.579	106	0.734	142	0.923	178	0.999	214	0.942	250	0.771	286	0.594	322	0.590
35	0.602	71	0.581	107	0.740	143	0.927	179	1.000	215	0.939	251	0.765	287	0.591	323	0.592

Figure 1

**Antenna Azimuthal Pattern
W15ES-D Myrtle Beach, SC
Facility ID 185605
Ch. 15 15 kW Directional**

prepared for
Gray Television Licensee, LLC

August, 2022



Figure 2
Coverage Contour Comparison
W15ES-D Myrtle Beach, SC
Facility ID 185605
Ch. 15 15 kW Directional

prepared for
Gray Television Licensee, LLC
August, 2022

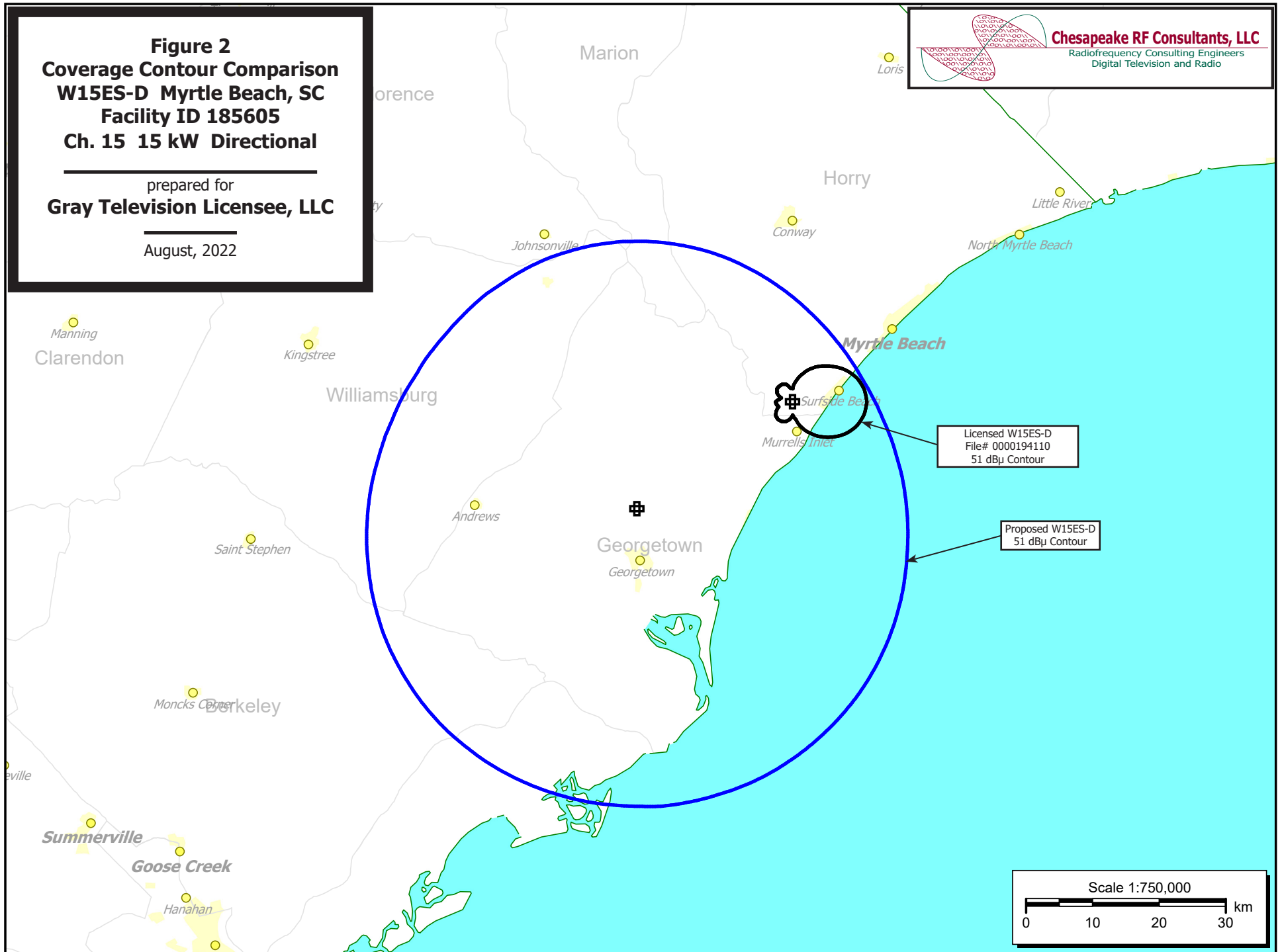


Table 1 W15ES-D TVStudy Analysis of Proposal (page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: W15ES-D 1038068 prop_, Model: Longley-Rice
Start: 2022.08.30 08:17:50

Study created: 2022.08.30 08:17:50

Study build station data: LMS TV 2022-08-29

Proposal: W15ES-D D15 LD APP Georgetown, SC
File number: W15ES-D 1038068 prop
Facility ID: 185605
Station data: User record
Record ID: 4625
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	WRDC	D14	DT	LIC	DURHAM, NC	BLANK0000125503	257.5 km
No	WHKY-TV	D14	DD	LIC	HICKORY, NC	BLANK0000109333	284.3
No	WSCG-LD	D14+	LD	LIC	BEAUFORT, ETC., SC	BLANK0000063818	177.6
Yes	W14EZ-D	D14	LD	CP	MYRTLE BEACH, SC	BLANK0000198444	37.8
No	W14EZ-D	D14	LD	LIC	MYRTLE BEACH, SC	BLANK0000194108	37.8
No	WUJX-LD	D15	LD	LIC	JACKSONVILLE, FL	BLANK0000121572	412.0
No	WDDZ-LD	D15	LD	CP	AUGUSTA, GA	BLANK0000159534	236.5
No	WDDZ-LD	D15	LD	LIC	AUGUSTA, GA	BLANK0000158634	268.8
No	WPHJ-LD	D15+	LD	LIC	BAXLEY, GA	BLANK0000187241	246.4
No	W15EB-D	D15	DC	LIC	CHARLOTTE, NC	BLANK0000188950	242.7
No	WDKT-LD	D15	LD	LIC	HENDERSONVILLE, NC	BLANK0000089000	330.8
No	W15DY-D	D15	LD	LIC	MARION, ETC., NC	BLANK0000119377	349.9
No	WRAZ	D15	DT	LIC	RALEIGH, NC	BLANK0000143683	257.5
No	W15EF-D	D15	LD	LIC	SPARTA, NC	BLANK0000055108	379.8
No	WILM-LD	D15	LD	LIC	WILMINGTON, NC	BLANK0000055240	138.6
No	WHWD-LD	D15	LD	LIC	Winston-Salem, NC	BLANK0000143309	306.4
Yes	WLTX	D15	DT	LIC	COLUMBIA, SC	BLANK0000082085	153.4
No	W15DC-D	D15	LD	LIC	FLORENCE, SC	BLANK0000178761	109.7
No	W15DC-D	D15	LD	CP	FLORENCE, SC	BLANK0000185135	102.4
No	W15DO-D	D15	LD	LIC	NORFOLK, VA	BLANK0000120726	334.2
No	W15DO-D	D15	LD	CP	NORFOLK, VA	BLANK0000157818	378.7
No	WSAV-TV	D16	DT	LIC	SAVANNAH, GA	BLANK0000055021	242.3
No	WPXU-TV	D16	DT	LIC	JACKSONVILLE, NC	BLANK0000129487	203.6
No	WJPM-TV	D16	DT	LIC	FLORENCE, SC	BLANK0000138174	101.3

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D15
Mask: Full Service
Latitude: 33 26 48.00 N (NAD83)
Longitude: 79 17 58.50 W
Height AMSL: 121.6 m
HAAT: 0.0 m
Peak ERP: 15.0 kW
Antenna: DIE TLP-B 180.0 deg
Elev Pattn: Generic
Elec Tilt: 0.50

48.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	6.24 kW	115.9 m	42.4 km
45.0	5.14	116.2	41.5
90.0	6.34	118.7	42.7
135.0	11.9	118.6	45.9
180.0	15.0	117.8	47.0

Table 1 W15ES-D TVStudy Analysis of Proposal
(page 2 of 3)



225.0 12.1 117.9 45.9
270.0 6.55 115.3 42.6
315.0 5.02 114.9 41.3

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 117 m

Distance to Canadian border: 954.4 km

Distance to Mexican border: 1889.7 km

Conditions at FCC monitoring station: Powder Springs GA
Bearing: 276.8 degrees Distance: 503.9 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 295.4 degrees Distance: 2414.0 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%

Interference to BLANK0000198444 CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W14EZ-D	D14	LD	CP	MYRTLE BEACH, SC	BLANK0000198444	
Undesireds:	W15ES-D	D15	LD	APP	Georgetown, SC	W15ES-D 1038068 prop	37.8 km
	W15DC-D	D15	LD	LIC	FLORENCE, SC	BLANK0000178761	82.4
	Service area		Terrain-limited		IX-free, before	IX-free, after	Percent New IX
	7776.8	343,792	7776.8	343,792	7776.8	339,710	0.87 1.19
Undesired			Total IX		Unique IX, before	Unique IX, after	
W15ES-D D15 LD APP		67.6	4,082		67.6	4,082	

Interference to BLANK0000082085 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WLTX	D15	DT	LIC	COLUMBIA, SC	BLANK0000082085	
Undesireds:	W15ES-D	D15	LD	APP	Georgetown, SC	W15ES-D 1038068 prop	153.4 km
	WHKY-TV	D14	DD	LIC	HICKORY, NC	BLANK0000109333	159.5
	W15EB-D	D15	DC	LIC	CHARLOTTE, NC	BLANK0000188950	122.9
	WRAZ	D15	DT	LIC	RALEIGH, NC	BLANK0000143683	268.9
	WJPM-TV	D16	DT	LIC	FLORENCE, SC	BLANK0000138174	96.0
	Service area		Terrain-limited		IX-free, before	IX-free, after	Percent New IX
	34749.0	1,582,666	34626.1	1,579,876	33164.2	1,499,927	1.00 0.40
Undesired			Total IX		Unique IX, before	Unique IX, after	
W15ES-D D15 LD APP		334.9	6,009		330.9	5,985	
WHKY-TV D14 DD LIC		3.0	0		0.0	0	
W15EB-D D15 DC LIC		516.8	19,725		418.7	15,678	
WRAZ D15 DT LIC		774.3	16,522		591.7	11,492	
WJPM-TV D16 DT LIC		353.4	42,747		268.9	41,764	

Interference to proposal scenario 1
2.06% interference received

Call	Chan	Svc	Status	City, State	File Number	Distance
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Table 1 W15ES-D TVStudy Analysis of Proposal
(page 3 of 3)



Desired:	W15ES-D	D15	LD	APP	Georgetown, SC	W15ES-D 1038068 prop	
Undesireds:	W14EZ-D	D14	LD	CP	MYRTLE BEACH, SC	BLANK0000198444	37.8 km
	WDDZ-LD	D15	LD	CP	AUGUSTA, GA	BLANK0000159534	236.5
	WLTX	D15	DT	LIC	COLUMBIA, SC	BLANK0000082085	153.4
	W15DC-D	D15	LD	LIC	FLORENCE, SC	BLANK0000178761	109.7
	W15DO-D	D15	LD	LIC	NORFOLK, VA	BLANK0000120726	334.2

Service area				Terrain-limited		IX-free		Percent IX					
6015.6		149,976		6015.6		149,976		5770.8	146,890	4.07	2.06		
Undesired				Total IX		Unique IX		Prcnt Unique IX					
W14EZ-D		D14 LD CP		18.8		1,314		18.8		1,314		0.31	0.88
WLTX		D15 DT LIC		226.0		1,772		226.0		1,772		3.76	1.18

Interference to proposal scenario 2

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W15ES-D	D15	LD	APP	Georgetown, SC	W15ES-D 1038068 prop	
Undesireds:	WDDZ-LD	D15	LD	CP	AUGUSTA, GA	BLANK0000159534	236.5 km
	WLTX	D15	DT	LIC	COLUMBIA, SC	BLANK0000082085	153.4
	W15DC-D	D15	LD	LIC	FLORENCE, SC	BLANK0000178761	109.7
	W15DO-D	D15	LD	LIC	NORFOLK, VA	BLANK0000120726	334.2

Service area		Terrain-limited		IX-free		Percent IX			
6015.6	149,976	6015.6	149,976	5789.6	148,204	3.76	1.18		
Undesired				Total IX	Unique IX	Prcnt Unique IX			
WLTX	D15	DT	LIC	226.0	1,772	226.0	1,772	3.76	1.18

**Channel and
Facility
Information**

Section	Question	Response
Facility ID	185605	
State	South Carolina	
City	MYRTLE BEACH	
LPD Channel	15	

**Antenna Location
Data**

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1038068
Coordinates (NAD83)	Latitude	33° 26' 48.0" N+
	Longitude	079° 17' 58.5" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	152.4 meters
	Support Structure Height	146.3 meters
	Ground Elevation (AMSL)	8.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	113.4 meters
	Height of Radiation Center Above Mean Sea Level	121.6 meters
	Effective Radiated Power	15 kW

Antenna
Technical Data

Section	Question	Response
Antenna Type	Antenna Type	Directional Custom
	Do you have an Antenna ID?	No
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	Dielectric
	Model	TLP-8B/VP
	Rotation	180 degrees
	Electrical Beam Tilt	0.5
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
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	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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