

ENGINEERING EXHIBIT

Application for Digital Companion Channel For Low Power Television Station

prepared for

Hearst Properties Inc. WMUR-LP Littleton, NH Facility ID 73295 Ch. 25 15 kW Directional

Hearst Properties Inc. ("Hearst") is the licensee of analog Low Power Television station WMUR-LP, Channel 29, Littleton NH, Facility ID 73295 (BLTTL-20000601AEG). *Hearst* herein seeks a Construction Permit to authorize a Digital Companion Channel ("DCC") for WMUR-LP to operate on Channel 25.

As proposed herein, the WMUR-LP DCC facility will utilize the tower structure associated with FCC Antenna Structure Registration number 1034698, located 22.0 km (13.7 miles) from the WMUR-LP licensed analog site. The proposed WMUR-LP DCC facility will utilize an existing broadband antenna which is side-mounted on the tower and no change to the overall structure height will result.

The proposed effective radiated power is 15 kW using a "full service" out of channel emission mask. The proposed antenna is an ERI model i230ECW-16-23/48 having elliptical polarization (29.3% vertical power). The maximum horizontally polarized ERP is 15 kW and the maximum vertically polarized ERP is 4.4 kW. The vertically polarized component will not exceed the horizontally polarized component at any azimuth. A plot of the directional antenna's azimuthal pattern is supplied in Figure 1. The antenna will be shared with the licensed auxiliary facility of WLED-TV (file# 0000124421, Ch. 23, Littleton NH, Fac ID 69328).

Figure 1 depicts the relevant coverage contours of the licensed analog WMUR-LP facility (74 dB μ) and that of the proposed DCC facility (51 dB μ), 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 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 US facility. The site is located 73.2 km from the US border with Canada, and Table 1 shows that any predicted interference to relevant Canadian stations does not affect any populated area.

Human Exposure to Radiofrequency Electromagnetic Field

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 less than 20 percent relative field at angles 40 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 $1.9 \ \mu$ W/cm², which is 0.5 percent of the general population / uncontrolled maximum permissible 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. 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 FCCs implementation of TVStudy show excellent correlation.



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 from FCC Form at Time of Upload

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Table 1 WMUR-LP TVStudy Analysis of Proposal

(page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: WMUR-LP Ch25 DCC_prop #11024, Model: Longley-Rice
Start: 2021.03.02 13:57:06

Study created: 2021.03.02 13:57:05

Study build station data: LMS TV 2021-03-02

Proposal: WMUR-LP D25 LD APP LITTLETON, NH File number: WMUR-LP Ch25 DCC_prop Facility ID: 73295 Station data: User record Record ID: 3501 Country: U.S. Zone: II

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

Search options: Non-U.S. records included Baseline record excluded if station has CP

Individual records excluded: 0000053201 DDW38CB D25+ LD APP LITTLETON, NH BLANK0000053201

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	WIPL	D24	DT	LIC	LEWISTON, ME	BLANK0000075152	96.2 km
No	WTEN	D24	DT	LIC	ALBANY, NY	BLANK0000082692	265.4
No	WMEB-TV	D25	LD	LIC	ORONO, ME	BLEDT20110729ADO	255.3
No	WWOR-TV	D25	DT	LIC	SECAUCUS, NJ	BLANK0000054140	445.4
No	W26CE	D25	LD	CP	NEW YORK, NY	BDISDTL20100120ABI	397.8
Yes	WMHT	D25	DT	LIC	SCHENECTADY, NY	BLANK0000091434	265.4
No	WTVU-CD	D25	DC	LIC	SYRACUSE, NY	BLANK0000107995	383.8
No	W25AT-D	D25	LD	LIC	TUPPER LAKE, NY	BLDTT20110425ABT	219.0
No	WJAR	D25	DT	LIC	PROVIDENCE, RI	BLANK0000087546	278.9
No	W25BT-D	D25	LD	LIC	MONKTON, VT	BLDTT20110425ABV	111.2
No	WGGB-TV	D26	DT	LIC	SPRINGFIELD, MA	BLANK0000083684	246.0
No	WTMW	D26	LD	LIC	POLAND SPRING, ME	BLCDT20100423ABV	141.2
No	WYCU-LD	D26	LD	LIC	CHARLESTOWN, ETC., NH	BLDTL20121214ABJ	115.4
No	W27BL	N27+	ТΧ	LIC	BERLIN, NH	BLTTL19950530IQ	46.8
No	WMNE-LP	N32z	TΧ	LIC	PORTLAND, ME	BLTT20020429AAV	131.0
No	CIVS-DT	D24	DT	LIC	SHERBROOKE, QC	BLANKCANADA311	113.8
No	CBOT-DT	D25	DT	LIC	OTTAWA, ON	BLANKCANADA203	347.9
Yes	CBVT-DT	D25	DT	LIC	QUBEC, QC	BLANKCANADA287	275.2
No	CIVM-DT	D26	DT	LIC	MONTRAL, QC	BLANKCANADA277	195.8

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D25 Mask: Full Service Latitude: 44 21 10.90 N (NAD83) Longitude: 71 44 14.90 W Height AMSL: 725.0 m HAAT: 372.1 m Peak ERP: 15.0 kW Antenna: Ch25 i230ECW 0.0 deg Elev Pattrn: Generic Elec Tilt: 0.75 49.9 dBu contour: Azimuth ERP HAAT Distance 0.0 deg 14.9 kW 351.7 m 59.5 km 45.0 4.81 330.5 52.4 90.0 0.286 372.6 37.9 135.0 0.231 356.3 36.1 180.0 3.75 361.3 52.6

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(P=3====)	UK-LP I	VStudy	Analysis o	of Proposal	The second		Radiofrequenc Digital Tel	KF Consultants, LLC y Consulting Engineers levision and Radio
225.0 1 270.0 8 315.0 8	4.4 8.55 8.79	411.4 425.8 366.9	62.3 59.9 57.4					
**Proposal 24 Distance to C	.85 dBu d Canadian b	contour o porder:	crosses Can 73.2 km	adian border, coor	dinatio	n required		
Distance to M	Mexican bo	order: 30	044.6 km					
Conditions at Bearing: 86.3	FCC moni degrees	itoring s Distar	station: Be nce: 211.1	lfast ME km				
Proposal is n	ot withir	n the Wes	st Virginia	quiet zone area				
Conditions at Bearing: 272.	: Table Mo 1 degrees	ountain n s Dista	receiving z ance: 2774.	one: 5 km				
Study cell si Profile point	ze: 1.00 spacing:	km : 1.00 kr	n					
Maximum new I Maximum new I	X to ful X to LPTV	l-service V: 2.00%	e and Class	A: 0.50%				
Interference	to BLANK(000009143	34 LIC scen	 ario 1				
Interference Desired:	to BLANK(Call WMHT	000009143 Chan & D25 I	34 LIC scen Svc Status DT LIC	ario 1 City, State SCHENECTADY, NY		File Number BLANK00000914	434	Distance
Interference Desired: Undesireds:	to BLANK(Call WMHT WWOR-LP WWOR-TV WSKA WTVU-CD WJAR WGGB-TV CBOT-DT	Chan 2 D25 1 D25 1	34 LIC scen Svc Status DT LIC LD APP DT LIC DT LIC DC LIC DT LIC DT LIC DT LIC DT LIC DT LIC	ario 1 City, State SCHENECTADY, NY LITTLETON, NH SECAUCUS, NJ CORNING, NY SYRACUSE, NY PROVIDENCE, RI SPRINGFIELD, MA OTTAWA, ON		File Number BLANK0000914 WMUR-LP Ch25 BLANK0000542 BLANK0000802 BLANK00001079 BLANK0000836 BLANK0000836 BLANKCANADA20	DCC_prop 140 258 995 546 584 03	Distance 265.4 km 212.6 257.5 182.2 239.5 119.6 352.0
Interference Desired: Undesireds: Servi 33067.5 1,	to BLANK(Call WMHT WWOR-TV WSKA WTVU-CD WJAR WGGB-TV CBOT-DT .ce area 716,350	Chan S D25 I D25 I D25 I D25 I D25 I D25 I D25 I D25 I D25 I D26 I D25 I D25 I D25 I	34 LIC scen Svc Status DT LIC LD APP DT LIC DT LIC DT LIC DT LIC DT LIC DT LIC DT LIC T LIC T LIC 27 LIC 27 LIC	ario 1 City, State SCHENECTADY, NY LITTLETON, NH SECAUCUS, NJ CORNING, NY SYRACUSE, NY PROVIDENCE, RI SPRINGFIELD, MA OTTAWA, ON ed IX-free, 80 26984.4 1,5	before 33,115	File Number BLANK00000914 WMUR-LP Ch25 BLANK0000054 BLANK0000802 BLANK0000837 BLANK0000837 BLANK0000837 BLANKCANADA20 IX-free, 26978.4 1,5	134 DCC_prop 140 258 395 546 584 03 , after 533,115	Distance 265.4 km 212.6 257.5 182.2 239.5 119.6 352.0 Percent New IX 0.02 0.00

Desired:	Call CBVT-DT	Chan D25	Svc DT	Status LIC	City QUBE	, State C, QC			File Numbe BLANKCANAI	er 0A287	Distanc	e
Undesireds:	WMUR-LP CIVS-DT CFTF-DT-1(D25 D24 DD26	LD DT DC	APP LIC LIC	LITT: SHERI BAIE	LETON, NH BROOKE, Q STPAUL,	i QC		WMUR-LP CP BLANKCANAI BLANKCANLE	25 DCC_prop 0A311 2393	275.2 k 177.5 99.3	m
Serv 28587.7 1	ice area ,199,201	Те 24570.	rrai 4	in-limite 1,151,09	ed 97 :	IX-fr 24559.2	ree, befc 1,151,0	ere 97	IX-fr 24558.2	ee, after 1,151,097	Percent 0.00	New IX 0.00
Undesired WMUR-LP D25 CIVS-DT D24 CFTF-DT-10 D	LD APP DT LIC 26 DC LIC	3. 10. 1	0 1 .0	Total I	IX 0 0 0	Unique 10.1 1.0	IX, befc	ore 0 0	Unique 1.0 8.1 1.0	IX, after 0 0 0		

Interference to proposal scenario 1

Table 1 WMUR-LP TVStudy Analysis of Proposal (page 3 of 3)



Desired:	Call WMUR-LP	Chan D25	Svc LD	Status APP	City, LITTL	State ETON, NH		File Nu WMUR-LP	mber Ch25 DCC_prop	Distance
Undesireds:	WMHT WJAR CBVT-DT	D25 D25 D25	DT DT DT	LIC LIC LIC	SCHEN PROVI QUBEC	ECTADY, DENCE, R , QC	NY I	BLANK00 BLANK00 BLANKCA	00091434 00087546 NADA287	265.4 km 278.9 275.2
Serv 8784.9	ice area 99 , 139	Te 5885.	rrai 1	in-limite 63,43	ed 36 -	5875.1	IX-free 63,436	Pe. 0.17	rcent IX 0.00	
Undesired WMHT D25 DT WJAR D25 DT CBVT-DT D25	LIC LIC DT LIC	5. 2. 3.	0 0 0	Total I	X 0 0 0	5.0 2.0 3.0	Unique IX 0 0 0	Prcnt U: 0.09 0.03 0.05	nique IX 0.00 0.00 0.00	

Channel and	Section	Question	Response
Facility Information	Facility ID	73295	
	State	New Hampshire	
	City	Littleton	
	LPD Channel	25	

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1034698
Coordinates (NAD83)	Latitude	44° 21' 10.9" N+
	Longitude	071° 44' 14.9" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	136.2 meters
	Support Structure Height	121.9 meters
	Ground Elevation (AMSL)	606.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	118.8 meters
	Height of Radiation Center Above Mean Sea Level	725.0 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	Manufacturer:	ERI
	Model	Model	i230ECW-16-23/48
		Rotation	0 degrees
		Electrical Beam Tilt	0.75
		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	0.998	90	0.138	180	0.500	270	0.755
10	0.964	100	0.110	190	0.632	280	0.776
20	0.882	110	0.103	200	0.764	290	0.815
30	0.764	120	0.103	210	0.882	300	0.815
40	0.632	130	0.110	220	0.964	310	0.776
50	0.500	140	0.138	230	0.998	320	0.755
60	0.380	150	0.199	240	0.966	330	0.800
70	0.279	160	0.279	250	0.889	340	0.889
80	0.199	170	0.380	260	0.800	350	0.966

Additional Azimuths

Degree	V _A
359	1.000
231	1.000