

DELAWDER COMMUNICATIONS, INC.

P.O. Box 1095
Ashburn, Virginia 20146-1095
(703) 299-9222

ENGINEERING REPORT

WLZH-LD, Baltimore, MD Channel 14 – LMR Protection

ENGINEERING STATEMENT REGARDING LAND MOBILE RADIO PROTECTION

This is a showing of protection to land mobile radio (“LMR”) facilities by the CP facility of WLZH-LD (facility ID 57539), as required by a condition on the CP. Specifically, the following is a showing that “adequate measures to identify and substantially eliminate objectionable interference which may be caused to existing land mobile radio facilities in the 460 to 470 MHz band” have been made. This is supported by documentation that “objectionable interference will not be caused to existing land mobile radio facilities”. Such documentation is to be submitted along with the request for Program Test Authority

STUDY

The CP facility has an omnidirectional slot antenna with a maximum ERP of 15 kW. This analysis demonstrates that all fixed LMR receive locations that are within a study distance of 30 kilometers from the WLZH-LD transmitter site are predicted to receive a signal level from WLZH-LD that is below the -126 dBm noise floor. Also, any LMR mobile use of these frequencies that are immediately below 470 MHz are expected to be protected. (Note that this result is based on a free-space-loss {“FSL”} predicted LPTV station signal level and does not take into account additional attenuation that may result due to terrain obstruction.)

Detailed calculations were performed to those LMS receive points between 468.93 and 470 MHz that were located within 30 kilometers of the WLZH-LD transmitter site. These results are in the attached Figure EE1 – a listing of all known LMR stations that meet the study requirement criteria and were identified from the FCC’s ULS database. (There is also a showing on Figure EE1 that LMR below 468.93 MHz do not warrant a detailed study and are adequately protected.) Due to the nature of the dual 8-pol filtering that is used by WLZH-LD, the 30 kilometer distance is deemed appropriate as a study distance.

A second Dielectric 8-Pole Sharp-tuned mask filter (model UT8D7F-3K) has been installed in a cascaded manner with the full-service emission mask filter to cause a very sharp attenuation of the signal just beyond the lower channel-band edge of channel 14. Attached as Figure EE2 is a tabulation provided by Dielectric that represents the ADDED mask filter’s frequency response between 469 to 470 MHz. (It is noted that at 470.000

MHz, the lower channel-band edge, the attenuation is 21.17 dB. At 470.260 MHz, the attenuation is 3.0 dB. This additional channel 14 lower channel-band edge signal roll-off is the unavoidable result of the added sharpness of the band-edge filtering requirement that is associated with this 8-pole filter.) Since this filtering is in addition to the full-service emission mask filtering, the minimum attenuation beyond the 470-MHz edge is 21.17 dB plus 47 dB (the minimum attenuation of a full-service emission mask as required by the FCC), a total attenuation value of 68.17 dB.

The several calculated fields of the Figure EE1 spreadsheet are as follows:

Ch14 LPTV ERP-dBm : The WLZH-LD ERP in dBm. It is 71.76 dBm in all cases for this omnidirectional facility.

Combined Post-Filter Attenuation dB : These values are determined by referencing Figure EE2 and adding 47 dB (to account for the cascaded two filters).

Adjustment Factor-dB : The total channel power within the 6 MHz DTV bandwidth is adjusted for an equivalent channel power within the 12.5 kHz channel bandwidth used by the LMR station. This adjustment factor ($10\text{LOG}\{6000/12.5\}$) is 26.8 dB.

Worst-case Power on LMR Freq in dBm : ERP – Filter attenuation – Adjustment Factor.

Free Space Loss-dB : Equals $20\text{LOG}(\text{Dist_km}) + 20\text{LOG}(\text{FrqMHz}) + 32.45 - (2*2.15)$.

Calculated Interf signal Power level-dBm : Worst-case Power – Free Space Loss.

CONCLUSION

As demonstrated above, the signal from WLZH-LD is below the noise floor for all examined fixed LMR stations of Figure EE1. Also, notes 7 to 20 of Figure EE1 reflect the unlikelihood of interference occurring to any LMR mobile use. Therefore, all LMR stations of the FCC's database of LMR are considered protected. The licensee of WLZH-LD commits to work with any existing LMR licensees in the 460 to 470 MHz band that may be impacted by the actual operation of WLZH-LD to determine whether WLZH-LD is causing an interference problem and to take any remedial steps required to resolve any reports of actual interference.

By: Darryl DeLawder, President
On April 8, 2023

FIGURE EE1 : LMR DETAILED STUDY FOR WLZH-LD, BALTIMORE, MD CHANNEL 14 AS AUTHORIZED AS OF APRIL 8, 2023

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Call Sign	Note	Rec Site	L M R (NOTE 3) LATITUDE			L O N G I T U D E LONGITUDE			Km-Dist from ch14 LPTV	Azimuth from ch14 LPTV	LMR Assigned Frg-MHz	(A)	(B)	(C)	(D)	(E)	(F)	(E - F) (NOTE 6)
			Deg	Min	Sec	Deg	Min	Sec				ch14 LPTV ERP-dBm	Added 8-pole Filter Attenuation dB (NOTE 4)	Combined Post-Filter Attenuation dB (B + 47) (NOTE 5)	Adjust- ment Factor-dB	Worst-case Power on LMR Freq in dBm (A-C-D)	Free Space Loss-dB	Calculated Interf signal Power level-dBm
Max Study Dist Determination (NOTE 1)									12	N/A	469.99	71.76	21	68	26.8	-23.04	103.1754	-126.2153973
Bottom LMS Freq to Study Determination (NOTE 2)									0.1	N/A	468.93	71.76	63	110	26.8	-65.04	61.57216	-126.6121604
WNVC813 (MO)		1	39	30	30.4	76	36	51.9	4.8	261.2	469.675	71.76	48.6	95.6	26.8	-50.64	95.21077	-145.8507736
WSR880 (MO)		1	39	27	32.4	76	35	38.9	6.9	205.6	469.575	71.76	49.2	96.2	26.8	-51.24	98.36108	-149.6010812
WQCE989 (MO)		1	39	27	34.2	76	38	3.1	8.9	226.1	469.8875	71.76	58	105	26.8	-60.04	100.5777	-160.617678
WQRV880 (MO)		1	39	26	14	76	37	32.3	10.3	213.3	469.7875	71.76	51.8	98.8	26.8	-53.84	101.8448	-155.6847736
WQSY943 (MO)		1	39	33	8.6	76	37	28.3	7	306.7	469.45	71.76	51.4	98.4	26.8	-53.44	98.48375	-151.9237477
WQWV830 (MO)		1	39	27	47.3	76	38	23.5	9	230.1	469.075	71.76	59.6	106.6	26.8	-61.64	100.6597	-162.2996959
WQXM360 (MO)		1	39	26	56.9	76	37	48.9	9.5	219.7	469.7125	71.76	48.9	95.9	26.8	-50.94	101.1411	-152.0811145
KBK827 (FX)	20	0							0.31	N/A	469.8	71.76	52.7	99.7	26.8	-54.74	71.41549	-126.1554941
KNDK366 (FX)	20	0							0.42	N/A	469.525	71.76	50	97	26.8	-52.04	74.04816	-126.0881602
WNSG880 (FX)	7	0							4.7	N/A	469.975	71.76	29.1	76.1	26.8	-31.14	95.03345	-126.1734523
WNWF367 (FX)	8	0							0.14	N/A	469.875	71.76	59.8	106.8	26.8	-61.84	64.51221	-126.3522075
WNYH410 (FX)	9	0							0.42	N/A	469.525	71.76	50	97	26.8	-52.04	74.04816	-126.0881602
WPBR556 (FX)	20	0							0.46	N/A	469.725	71.76	49.3	96.3	26.8	-51.34	74.84203	-126.1820301
WPBR557 (FX)	10	0							4.7	N/A	469.975	71.76	29.1	76.1	26.8	-31.14	95.03345	-126.1734523
WPBW764 (FX)	11	0							0.31	N/A	469.375	71.76	52.8	99.8	26.8	-54.84	71.40763	-126.247633
WPEX752 (FX)	12	0							0.42	N/A	469.525	71.76	50	97	26.8	-52.04	74.04816	-126.0881602
KPKF819 (FX)	20	0							0.23	N/A	469.825	71.76	55.4	102.4	26.8	-57.44	68.82328	-126.2632792

FIGURE EE1 : LMR DETAILED STUDY FOR WLZH-LD, BALTIMORE, MD CHANNEL 14 AS AUTHORIZED AS OF APRIL 8, 2023

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Call Sign	Note	L M R			Km-Dist from ch14 LPTV	Azimuth from ch14 LPTV	LMR Assigned Frq-MHz	(A)	(B)	(C)	(D)	(E)	(F)	(E - F) (NOTE 6)
		(NOTE 3) Rec Site	L A T I T U D E Deg Min Sec	R L O N G I T U D E Deg Min Sec				ERP-dBm	Added 8-pole Filter Attenuation dB (NOTE 4)	Combined Post-Filter Attenuation dB (B + 47)	Adjust- ment Factor-dB	Worst-case Power on LMR Freq in dBm (A-C-D)	Free Space Loss-dB	Calculated Interf signal Power level-dBm
WPTH406 (FX)	13	0			0.31	N/A	469.8	71.76	52.7	99.7	26.8	-54.74	71.41549	-126.1554941
WPUE405 (FX)	14	0			0.32	N/A	469.4	71.76	52.5	99.5	26.8	-54.54	71.68386	-126.2238613
WPVX554 (FX)	20	0			0.14	N/A	469.875	71.76	59.8	106.8	26.8	-61.84	64.51221	-126.3522075
WQCK644 (FX)	15	0			0.11	N/A	468.975	71.76	61.9	108.9	26.8	-63.94	62.40085	-126.3408475
WQFK365 (FX)	16	0			0.42	N/A	469.525	71.76	50	97	26.8	-52.04	74.04816	-126.0881602
WQJI239 (FX)	17	0			0.35	N/A	469.4375	71.76	51.6	98.6	26.8	-53.64	72.46292	-126.1029165
WQPL218 (FX)	18	0			0.18	N/A	469.1688	71.76	57.3	104.3	26.8	-59.34	66.68203	-126.0220316
WQUP581 (FX)	19	0			0.34	N/A	469.425	71.76	52	99	26.8	-54.04	72.2109	-126.2509026

NOTES:

- Maximum Study Distance Determination: 12 km is the determined level. Any greater distance will have the LPTV signal below the noise floor at 470 MHz & below.
- Bottom LMR frequency to Study Determination: This is 468.93 MHz. The added filter is 63 dB or greater in attenuation below this frequency.
- This location is where the desired LMR signal is received. A zero refers to mobile sites as receiving the frequency.
- This represents the lowest attenuation value below the LMR frequency for the LMR station of the added post-transmitter filter. See the Figure EE-2 tabulation. 21 dB is the value at 470 MHz.
- The full-service emission mask PLUS the added 8-Pole cascaded filter attenuation.
- The noise-floor is -126 dBm. Any value at or below -126 dBm represents adequate protection.
- WNSG880 is licensed to the National Aquarium (25.9 km from the LPTV site). Mobile units are NOT expected to be located within 4.7 km of the LPTV site where predicted interference may exist.
- WNWF367's base site for its mobiles is 20.6 km from the LPTV site. The Mobile are licensed to serve only 8 km from this site. No mobiles will be with the potential interference distance of 0.34 km.
- WNYH410's base site for its mobiles is 19.4 km from the LPTV site. The Mobile are licensed to serve only 3 km from this site. No mobiles will be with the potential interference distance of 0.14 km.
- WPBR557's receive site for its mobile service is located 19.4 km from the LPTV transmitter site. The mobile units specify a service range of only 16 km for the WPBR557 receive site. Mobile units are NOT expected to be located within 4.7 km of the LPTV site where predicted interference may exist.
- WPBW764's base site for its mobiles is 28.7 km from the LPTV site. The Mobil are licensed to serve only 8 km from this site. No mobiles will be with the potential interference distance of 0.31 km.
- WPFX752's base site for its mobiles is 29.7 km from the LPTV site. The Mobil are licensed to serve only 16 km from this site. No mobiles will be with the potential interference distance of 0.42 km.
- WPTH406's base site for its mobiles is 19.6 km from the LPTV site. The Mobil are licensed to serve only 16 km from this site. No mobiles will be with the potential interference distance of 0.31 km.
- WPOE405's base site for its mobiles is 24.3 km from the LPTV site. The Mobil are licensed to serve only 24 km from this site. No mobiles will be with the potential interference distance of 0.32 km.
- WQCK664's base site for its mobiles is 28.7 km from the LPTV site. The Mobil are licensed to serve only 16 km from this site. No mobiles will be with the potential interference distance of 0.11 km.
- WQFK365's base site for its mobiles is 27.6 km from the LPTV site. The Mobil are licensed to serve only 16 km from this site. No mobiles will be with the potential interference distance of 0.42 km.
- WQJI239's base site for its mobiles is 26.0 km from the LPTV site. The Mobil are licensed to serve only 8 km from this site. No mobiles will be with the potential interference distance of 0.35 km.
- WQPL218's base site for its mobiles is 25.7 km from the LPTV site. The Mobil are licensed to serve only 16 km from this site. No mobiles will be with the potential interference distance of 0.18 km.
- WQUP581's base site for its mobiles is 17.6 km from the LPTV site. The Mobil are licensed to serve only 8 km from this site. No mobiles will be with the potential interference distance of 0.34 km.
- These five LMRS stations are located more than 17 km from the LPTV site. Mobile units are unlikely to be located near the LPTV site (0.42 km or less) where interference may occur.

FIGURE EE2 DIELECTRIC 8-POLE MASK FILTER FREQUENCY RESPONSE ATTENUATION

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9/24/2018 (measurement date)

! Stimulus(Hz)	S21(dB)	! Stimulus(Hz)	S21(dB)	! Stimulus(Hz)	S21(dB)
46900000.00	-61.44	469215000.00	-56.64	469430000.00	-51.67
469005000.00	-61.51	469220000.00	-56.60	469435000.00	-51.61
469010000.00	-61.29	469225000.00	-56.28	469440000.00	-51.73
469015000.00	-61.30	469230000.00	-56.37	469445000.00	-51.62
469020000.00	-61.10	469235000.00	-55.99	469450000.00	-51.48
469025000.00	-60.93	469240000.00	-56.00	469455000.00	-51.28
469030000.00	-60.80	469245000.00	-55.76	469460000.00	-51.13
469035000.00	-60.63	469250000.00	-55.80	469465000.00	-51.09
469040000.00	-60.68	469255000.00	-55.68	469470000.00	-50.98
469045000.00	-60.38	469260000.00	-55.62	469475000.00	-51.04
469050000.00	-60.36	469265000.00	-55.41	469480000.00	-50.83
469055000.00	-60.20	469270000.00	-55.07	469485000.00	-50.65
469060000.00	-60.15	469275000.00	-55.32	469490000.00	-50.55
469065000.00	-59.86	469280000.00	-54.86	469495000.00	-50.67
469070000.00	-59.96	469285000.00	-54.92	469500000.00	-50.41
469075000.00	-59.66	469290000.00	-54.66	469505000.00	-50.34
469080000.00	-59.79	469295000.00	-54.75	469510000.00	-50.42
469085000.00	-59.62	469300000.00	-54.61	469515000.00	-50.33
469090000.00	-59.39	469305000.00	-54.66	469520000.00	-50.10
469095000.00	-59.41	469310000.00	-54.23	469525000.00	-50.05
469100000.00	-59.26	469315000.00	-54.33	469530000.00	-49.84
469105000.00	-59.14	469320000.00	-54.07	469535000.00	-49.95
469110000.00	-59.08	469325000.00	-53.92	469540000.00	-49.78
469115000.00	-58.92	469330000.00	-53.99	469545000.00	-49.70
469120000.00	-58.76	469335000.00	-53.83	469550000.00	-49.65
469125000.00	-58.57	469340000.00	-53.77	469555000.00	-49.51
469130000.00	-58.48	469345000.00	-53.56	469560000.00	-49.66
469135000.00	-58.47	469350000.00	-53.57	469565000.00	-49.38
469140000.00	-58.41	469355000.00	-53.53	469570000.00	-49.46
469145000.00	-58.33	469360000.00	-53.45	469575000.00	-49.29
469150000.00	-58.09	469365000.00	-53.09	469580000.00	-49.31
469155000.00	-57.83	469370000.00	-53.08	469585000.00	-49.26
469160000.00	-57.85	469375000.00	-52.84	469590000.00	-49.15
469165000.00	-57.69	469380000.00	-53.01	469595000.00	-49.03
469170000.00	-57.38	469385000.00	-52.72	469600000.00	-48.98
469175000.00	-57.39	469390000.00	-52.63	469605000.00	-49.01
469180000.00	-57.21	469395000.00	-52.66	469610000.00	-49.01
469185000.00	-57.52	469400000.00	-52.50	469615000.00	-48.92
469190000.00	-56.94	469405000.00	-52.41	469620000.00	-48.93
469195000.00	-56.99	469410000.00	-52.34	469625000.00	-48.86
469200000.00	-57.03	469415000.00	-52.12	469630000.00	-48.93
469205000.00	-56.68	469420000.00	-51.96	469635000.00	-48.85
469210000.00	-56.81	469425000.00	-52.03	469640000.00	-48.85

FIGURE EE2 DIELECTRIC 8-POLE MASK FILTER FREQUENCY RESPONSE ATTENUATION

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9/24/2018 (measurement date)

! Stimulus(Hz)	S21(dB)	! Stimulus(Hz)	S21(dB)
469645000.00	-48.72	469860000.00	-59.13
469650000.00	-48.72	469865000.00	-59.52
469655000.00	-48.94	469870000.00	-59.33
469660000.00	-48.64	469875000.00	-59.85
469665000.00	-48.78	469880000.00	-58.81
469670000.00	-48.75	469885000.00	-58.06
469675000.00	-48.66	469890000.00	-57.33
469680000.00	-48.86	469895000.00	-56.63
469685000.00	-48.84	469900000.00	-55.23
469690000.00	-48.85	469905000.00	-53.88
469695000.00	-49.11	469910000.00	-52.33
469700000.00	-48.94	469915000.00	-50.64
469705000.00	-49.17	469920000.00	-48.60
469710000.00	-48.96	469925000.00	-46.80
469715000.00	-49.28	469930000.00	-45.10
469720000.00	-49.37	469935000.00	-43.19
469725000.00	-49.38	469940000.00	-41.41
469730000.00	-49.53	469945000.00	-39.54
469735000.00	-49.56	469950000.00	-37.75
469740000.00	-49.91	469955000.00	-35.97
469745000.00	-49.92	469960000.00	-34.26
469750000.00	-50.11	469965000.00	-32.51
469755000.00	-50.33	469970000.00	-30.83
469760000.00	-50.63	469975000.00	-29.11
469765000.00	-50.70	469980000.00	-27.50
469770000.00	-50.98	469985000.00	-25.85
469775000.00	-51.19	469990000.00	-24.25
469780000.00	-51.41	469995000.00	-22.68
469785000.00	-51.89	470000000.00	-21.17
469790000.00	-52.15		
469795000.00	-52.49		
469800000.00	-52.77		
469805000.00	-53.30		
469810000.00	-53.84		
469815000.00	-54.33		
469820000.00	-55.01		
469825000.00	-55.41		
469830000.00	-55.95		
469835000.00	-56.80		
469840000.00	-57.35		
469845000.00	-57.83		
469850000.00	-58.68		
469855000.00	-58.82		

(Attenuation is more than 60 dB below 469 MHz)