

Regulatory/Operating Classes Specifications

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Abstract

This proposal discusses

Channel numbering in the draft standard.

Channelization in TVWS in USA/Canada.

Channelization in TVWS in UK Digital Divided band.

Channelization in 7 MHz bands in Europe.

Current Numbering System for 802.11

Channel center frequency = Channel starting frequency + $5 \times nch$ (MHz) (17-27)

Where $nch = 1, \dots, 200$

Channel starting frequency = $\text{dot11ChannelStartingFactor} \times 500$ kHz

For example, $\text{dot11ChannelStartingFactor} = 10000$ indicates that Channel zero center frequency is 5.000 GHz. The value NULL for nch shall be reserved.

This system is generated for bandwidths of 5, 10, 20 and 40 MHz, where the difference between two center frequency is always a multiple of 5 MHz.

We are suggesting to use the same numbering system to keep consistency.

Overall Channelization

We are suggesting to use available TVWS channels as efficiently as possible. 5, 10, 20 and 40 MHz channels are placed to minimize the number of bands they occupy in TVWS.

Available TVWS channels in USA/Canada

TV Channel No	Freq. band (MHz)	Center Freq. (MHz)	TV Channel No	Freq. band (MHz)	Center Freq. (MHz)	TV Channel No	Freq. band (MHz)	Center Freq. (MHz)
2	54-60	57	19	500-506	503	36	602-608	605
3	60-66	63	20	506-512	509	37	608-614	611
4	66-72	69	21	512-518	515	38	614-620	617
5	76-82	79	22	518-524	521	39	620-626	623
6	82-88	85	23	524-530	527	40	626-632	629
7	174-180	177	24	530-536	533	41	632-638	635
8	180-186	183	25	536-542	539	42	638-644	641
9	186-192	189	26	542-548	545	43	644-650	647
10	192-198	195	27	548-554	551	44	650-656	653
11	198-204	201	28	554-560	557	45	656-662	659
12	204-210	207	29	560-566	563	46	662-668	665
13	210-216	213	30	566-572	569	47	668-674	671
14	470-476	473	31	572-578	575	48	674-680	677
15	476-482	479	32	578-584	581	49	680-686	683
16	482-488	485	33	584-590	587	50	686-692	689
17	488-494	491	34	590-596	593	51	692-698	695
18	494-500	497	35	596-602	599	52	698-704	701

Channelization in USA/Canada

In USA/CANADA, we need to have 5 starting frequencies. We selected 50 MHz, 51 MHz, 52 MHz , 53 MHz, 54MHz with dot11ChannelStartingFactors of 100, 102, 104,106,108 respectively.

We are suggesting to use only center frequencies of available bands for 5 MHz channels. This will additionally reduce adjacent channel interference problems.

For 10 MHz and 20 MHz channels, we are suggesting to use the center frequency (lower on center) of 2, 4 consecutive bands respectively.

For 40 MHz, we are suggesting to use 7 consecutive bands.

5 MHz TVWS channels for 802.11 in US/Canada

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
57	104	1	515	100	93	605	100	111
79	108	5	521	102	94	617	104	113
85	100	7	527	104	95	623	106	114
177	104	25	533	106	96	629	108	115
183	106	26	539	108	97	635	100	117
189	108	27	545	100	99	641	102	118
195	100	29	551	102	100	647	104	119
201	102	30	557	104	101	653	106	120
207	104	31	563	106	102	659	108	121
213	106	32	569	108	103	665	100	123
473	106	84	575	100	105	671	102	124
479	108	85	581	102	106	677	104	125
485	100	87	587	104	107	683	106	126
491	102	88	593	106	108	689	108	127
497	104	89	599	108	109	695	100	129
503	106	90						
509	108	91						

10 MHz TVWS channels for 802.11 in US/Canada

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
82	104	6	530	100	96	638	106	117
180	100	26	536	102	97	644	108	118
186	102	27	542	104	98	650	100	120
192	104	28	548	106	99	656	102	121
198	106	29	554	108	100	662	104	122
204	108	30	560	100	102	668	106	123
210	100	32	566	102	103	674	108	124
476	102	85	572	104	104	680	100	126
482	104	86	578	106	105	686	102	127
488	106	87	584	108	106	692	104	128
494	108	88	590	100	108			
500	100	90	596	102	109			
506	102	91	602	104	110			
512	104	92	620	100	114			
518	106	93	626	102	115			
524	108	94	632	104	116			

20 MHz TVWS channels for 802.11 in US/Canada

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
186	102	27	530	100	96	626	102	115
192	104	28	536	102	97	632	104	116
198	106	29	542	104	98	638	106	117
204	108	30	548	106	99	644	108	118
482	104	86	554	108	100	650	100	120
488	106	87	560	100	102	656	102	121
494	108	88	566	102	103	662	104	122
500	100	90	572	104	104	668	106	123
506	102	91	578	106	105	674	108	124
512	104	92	584	108	106	680	100	126
518	106	93	590	100	108	686	102	127
524	108	94	596	102	109			

40 MHz TVWS channels for 802.11

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
195	100	29	569	108	103
491	102	88	575	100	105
497	104	89	581	102	106
503	106	90	587	104	107
509	108	91	629	108	115
515	100	93	635	100	117
521	102	94	641	102	118
527	104	95	647	104	119
533	106	96	653	106	120
539	108	97	659	108	121
545	100	99	665	100	123
551	102	100	671	102	124
557	104	101	677	104	125
563	106	102			

Available TVWS channels in UK

TV Channel No	Freq. band (MHz)	Center Freq. (MHz)	TV Channel No	Freq. band (MHz)	Center Freq. (MHz)	TV Channel No	Freq. band (MHz)	Center Freq. (MHz)
21	470-478	474	39	614-622	618	50	702-710	706
22	478-486	482	40	622-630	626	51	710-718	714
23	486-494	490	41	630-638	634	52	718-726	722
24	494-502	498	42	638-646	642	53	726-734	730
25	502-510	506	43	646-654	650	54	734-742	738
26	510-518	514	44	654-662	658	55	742-750	746
27	518-526	522	45	662-670	666	56	750-758	754
28	526-534	530	46	670-678	674	57	758-766	762
29	534-542	538	47	678-686	682	58	766-774	770
30	542-550	546	48	686-694	690	59	774-782	778
			49	694-702	698	60	782-790	786

Channelization in UK

In UK, we are using same 5 starting frequencies, 50 MHz, 51 MHz, 52 MHz, 53 MHz, 54MHz with dot11ChannelStartingFactors of 100, 102, 104,106,108 respectively.

We are suggesting to use only center frequencies of available bands for 5 MHz, 20 MHz and 40 MHz channels. They will occupy 1, 3 consecutive and 5 consecutive bands respectively.

For 10 MHz and 20 MHz channels, we are suggesting to use the center frequency (lower on center) of 2 consecutive bands respectively.

5 MHz TVWS channels for 802.11 in UK

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
474	108	84	618	106	113	706	102	131
482	104	86	626	102	115	714	108	132
490	100	88	634	108	116	722	104	134
498	106	89	642	104	118	730	100	136
506	102	91	650	100	120	738	106	137
514	108	92	658	106	121	746	102	139
522	104	94	666	102	123	754	108	140
530	100	96	674	108	124	762	104	142
538	106	97	682	104	126	770	100	144
546	102	99	690	100	128	778	106	145
			698	106	129	786	102	147

10 MHz TVWS channels for 802.11 in UK

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
478	106	85	630	100	116	710	100	132
486	102	87	638	106	117	718	106	133
494	108	88	646	102	119	726	102	135
502	104	90	654	108	120	734	108	136
510	100	92	662	104	122	742	104	138
518	106	93	670	100	124	750	100	140
526	102	95	678	106	125	758	106	141
534	108	96	686	102	127	766	102	143
542	104	98	694	108	128	774	108	144
622	104	114	702	104	130	782	104	146

20 MHz TVWS channels for 802.11 in UK

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
482	104	86	626	102	115	706	102	131
490	100	88	634	108	116	714	108	132
498	106	89	642	104	118	722	104	134
506	102	91	650	100	120	730	100	136
514	108	92	658	106	121	738	106	137
522	104	94	666	102	123	746	102	139
530	100	96	674	108	124	754	108	140
538	106	97	682	104	126	762	104	142
			690	100	128	770	100	144
			698	106	129	778	106	145

40 MHz TVWS channels for 802.11 in UK

Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch	Center Freq. (MHz)	.dot11Ch.St. Factor	nch
490	100	88	634	108	116	706	102	131
498	106	89	642	104	118	714	108	132
506	102	91	650	100	120	722	104	134
514	108	92	658	106	121	730	100	136
522	104	94	666	102	123	738	106	137
530	100	96	674	108	124	746	102	139
			682	104	126	754	108	140
			690	100	128	762	104	142
			698	106	129	770	100	144

TV channels with 7 MHz Bandwidth

There are 7 MHz bands used in Europe, although they are not available for TVWS usage currently. 802.11af may consider to cover them.

TV Channel No	Freq. band (MHz)	Center Freq. (MHz)
2	47-54	50.5
3	54-61	57.5
4	61-68	64.5
5	174-181	177.5
6	181-188	184.5
7	188-195	191.5
8	195-202	198.5
9	202-209	205.5
10	209-216	212.5
11	216-223	219.5
12	223-230	226.5

Channelization in 7 MHz channels

For 5 MHz and 20 MHz channels, we decided to use center frequencies of each channel. For channel numbering 45.5 MHz, 46.5 MHz, 47.5 MHz , 48.5 MHz, 49.5 MHz as starting frequencies with dot11ChannelStartingFactors of 91, 93, 95, 97, 99 respectively.

For 10 MHz and 40 MHz channels, we decided to use center frequencies of each consecutive 2 and 6 channels. For channel numbering 49 MHz, 50 MHz, 51 MHz , 52 MHz, 53 MHz are selected as starting frequencies with dot11ChannelStartingFactors of 91, 93, 95, 97, 99 respectively.

5 MHz Channels

Center Freq. (MHz)	.dot11Channel St.Factor	nch
50.5	91	1
57.5	95	2
64.5	99	3
177.5	95	26
184.5	99	27
191.5	93	29
198.5	97	30
205.5	91	32
212.5	95	33
219.5	99	34
226.5	93	36

10 MHz Channels

Center Freq. (MHz)	.dot11Channel St.Factor	nch
54	98	1
61	102	2
181	102	26
188	106	27
195	100	29
202	104	30
209	98	32
216	102	33
223	106	34

20 MHz Channels

Center Freq. (MHz)	.dot11Channel St.Factor	nch
57.5	95	2
184.5	99	27
191.5	93	29
198.5	97	30
205.5	91	32
212.5	95	33
219.5	99	34

40 MHz Channels

Center Freq. (MHz)	.dot11Channel St.Factor	nch
195	100	29
202	104	30
209	98	32

Conclusions

We provided,

Channelization in USA/Canada.

Channelization in UK Digital Divided band.

Channelization in 7 MHz bands of Europe for 802.11 TVWS operation.

We are suggesting to use current numbering system of 802.11 system.