Large 128-Carrier Channel Clusters Example (Code Length Sort)

The figure shows composite controlled clustering of overlaping bandwidth orthogonal carriers that includes duplicates of about 2x unique carrier count (unique carrier count is 76) while maintaining common synchronization parameters of transmit and receive time of day. This configuration is not possible with multiple shift register based binary code lengths. This is an extreme limitation of shift register codes. Each unique CSK carrier contains orthogonal symbols with 1-to-4 quadrature symbols per carrier. The CSK codes generated are random binary codes with the maximum count of unique orthogonal CSK codes proportional to the factorial of total pulse width counts in the CSK half code. The CSK Code counts in this paper average about 30 where 30-factorial = 2.65252859812191058636308480000000 X 10^32 (very large number in category of “grains of sand on Earth beaches”). This parameter is made possible by the CSK RANDOM Binary Code Generator of **Patent No. US 10056937 B1 dated Aug. 21, 2018**.

These CSK Codes are consistent with I and Q quadrature phased QPSK modulation introduced in the 1960s. Each individual CSK root code is defined as a tier0 code. The half-code pairs are uniquely tandem shuffled and remerged to a full length binary code. Pairs of tier0 codes are XORed to form tier1 codes. Pairs of tier1 codes are XORed to form the tier2 codes defined as the final CSK full length codes. The figure bottom text summary shows the example total of 128 carriers (including duplicates) with an average of about 2 CSK carriers per unique carrier.

CarrierMHz	CSKCodeChips	ChiprateMHz	ChipRateMult	CSKBWMHz
3165	300	15	211	10
3180	300	15	212	10
3195	300	15	213	10
3161.6	304	15.2	208	10.13
3176.8	304	15.2	209	10.13
3192	304	15.2	210	10.13
3207.2	304	15.2	211	10.13
3222.4	304	15.2	212	10.13
3237.6	304	15.2	213	10.13
3172.4	308	15.4	206	10.26
3187.8	308	15.4	207	10.26
3203.2	308	15.4	208	10.26
3218.6	308	15.4	209	10.26
3234	308	15.4	210	10.26
3166.8	312	15.6	203	10.4
3182.4	312	15.6	204	10.4
3198	312	15.6	205	10.4
3213.6	312	15.6	206	10.4
3229.2	312	15.6	207	10.4
3175.8	316	15.8	201	10.53
3191.6	316	15.8	202	10.53
3207.4	316	15.8	203	10.53
3223.2	316	15.8	204	10.53
3239	316	15.8	205	10.53
3168	320	16	198	10.66
3184	320	16	199	10.66
3200	320	16	200	10.66
3216	320	16	201	10.66
3232	320	16	202	10.66
3175.2	324	16.2	196	10.8
3191.4	324	16.2	197	10.8
3207.6	324	16.2	198	10.8
3223.8	324	16.2	199	10.8
3165.2	328	16.4	193	10.93
3181.6	328	16.4	194	10.93
3198	328	16.4	195	10.93
3214.4	328	16.4	196	10.93
3230.8	328	16.4	197	10.93
3170.6	332	16.6	191	11.06
3187.2	332	16.6	192	11.06
3203.8	332	16.6	193	11.06
3220.4	332	16.6	194	11.06
3237	332	16.6	195	11.06
3175.2	336	16.8	189	11.2
3192	336	16.8	190	11.2
3208.8	336	16.8	191	11.2
3225.6	336	16.8	192	11.2
3162	340	17	186	11.33
3179	340	17	187	11.33
3196	340	17	188	11.33
3213	340	17	189	11.33
3230	340	17	190	11.33
3164.8	344	17.2	184	11.46
3182	344	17.2	185	11.46
3199.2	344	17.2	186	11.46
3216.4	344	17.2	187	11.46
3233.6	344	17.2	188	11.46
3166.8	348	17.4	182	11.6
3184.2	348	17.4	183	11.6
3201.6	348	17.4	184	11.6
3219	348	17.4	185	11.6
3236.4	348	17.4	186	11.6
3168	352	17.6	180	11.73
3185.6	352	17.6	181	11.73
3203.2	352	17.6	182	11.73
3220.8	352	17.6	183	11.73
3238.4	352	17.6	184	11.73
3168.4	356	17.8	178	11.86
3186.2	356	17.8	179	11.86
3204	356	17.8	180	11.86
3221.8	356	17.8	181	11.86
3168	360	18	176	12
3186	360	18	177	12
3204	360	18	178	12
3222	360	18	179	12
3166.8	364	18.2	174	12.13
3185	364	18.2	175	12.13
3203.2	364	18.2	176	12.13
3221.4	364	18.2	177	12.13
3164.8	368	18.4	172	12.26
3183.2	368	18.4	173	12.26
3201.6	368	18.4	174	12.26
3220	368	18.4	175	12.26
3238.4	368	18.4	176	12.26
3162	372	18.6	170	12.4
3180.6	372	18.6	171	12.4
3199.2	372	18.6	172	12.4
3217.8	372	18.6	173	12.4
3236.4	372	18.6	174	12.4
3177.2	376	18.8	169	12.53
3196	376	18.8	170	12.53
3214.8	376	18.8	171	12.53
3233.6	376	18.8	172	12.53
3173	380	19	167	12.66
3192	380	19	168	12.66
3211	380	19	169	12.66
3230	380	19	170	12.66
3168	384	19.2	165	12.8
3187.2	384	19.2	166	12.8
3206.4	384	19.2	167	12.8
3225.6	384	19.2	168	12.8
3162.2	388	19.4	163	12.93
3181.6	388	19.4	164	12.93
3201	388	19.4	165	12.93
3220.4	388	19.4	166	12.93
3175.2	392	19.6	162	13.06
3194.8	392	19.6	163	13.06
3214.4	392	19.6	164	13.06
3234	392	19.6	165	13.06
3168	396	19.8	160	13.2
3187.8	396	19.8	161	13.2
3207.6	396	19.8	162	13.2
3227.4	396	19.8	163	13.2
3180	400	20	159	13.33
3200	400	20	160	13.33
3220	400	20	161	13.33
3171.4	404	20.2	157	13.46
3191.6	404	20.2	158	13.46
3211.8	404	20.2	159	13.46
3232	404	20.2	160	13.46
3162	408	20.4	155	13.6
3182.4	408	20.4	156	13.6
3202.8	408	20.4	157	13.6
3223.2	408	20.4	158	13.6
3172.4	412	20.6	154	13.73
3193	412	20.6	155	13.73
3213.6	412	20.6	156	13.73
3234.2	412	20.6	157	13.73
NumCarrier	UniqNumCodes	RunDate		
128	29	5Feb2020		

Primary CSK Codes Advantages

- All position determination algorithms do not require more than 2 ranges to local cell tower
- Each line-of-site tower is assumed to be broadcasting precision LAT-LONG plus ALTITUDE
- There are 76 unique carriers in the total list of 128 transmitted carriers
- FCPW CSK Code generator creates a bandwidth of 2/3 X symbol chipping rate
- There are 1 to 5 orthogonal CSK binary codes per carrier
- Total receive throughput possible is about 2048+ Mbps