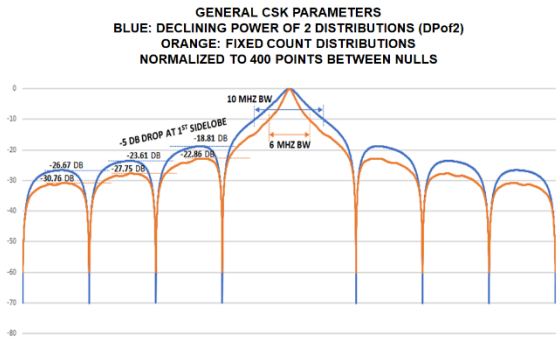
CSK Power Spectral Density Profiles

The current communications and navigation network environments with binary shift registers were first formally taught in 1964 digital communication courses at the Navy Graduate School in Monterey, CA. All digital communications and navigation systems still dictate the use of feedback shift registers in satellite and terrestrial digital systems. We have advanced from Kilohertz speed processors and Kilobyte memories to Gigahertz speed processors and Terabyte memories in the last 50 years, but still use the extremely limited shift-register technology in communications and navigation systems. The options are now open to replace binary shift registers with more advanced forms of memory-based random binary codes that are pre-generated and pre-filtered for CSK Codes with minimum symbol cross-correlation parameters. All CSK Codes are capable of extractions of 16 orthogonal symbols. Gigahertz processors and Terabyte fast memories can be used for the extraction processes to make the technology transition to the new CSK random digital coding technology possible. The overlayed power spectral density profiles in the figure point to solutions not considered in the last 50 years. First side-lobes of shift-register-based binary codes, shown in blue, are -18 dB or less relative to main lobe normalized 0-dB peak. This parameter has corrupted bandwidths of communications and navigation receive systems since the 1970s without any R&D answers ever pursued. The Patent CSK Code Generator is designed to correct this very old deficiency by designing the random CSK Code pulse-width distributions to be consistent with data transport power spectrum that produces a 1st side-lobe peak power density of -22.86 dB below the main lobe, as shown in the orange profile in the figure.



The major parameters that determine the final CSK Code power spectral density profiles are CSK Code pulse-width lengths in chips and distributions of CSK Code symbol pulse widths. The pulse-width count distributions are either CSK DPof2D, commonly used in precision time and position tracking systems, or FCPWD that are CSK-unique and ideal for symbol data transport configurations. All example unique Tier0 pulse widths are 1 to 10 bits in these discussions. The two XOR processes on Tier0 and Tier1 code pairs result in Tier2 CSK codes with power spectral density profiles, as shown in the figure. The CSK configurations apply to multiple chipping rates with multiple different CSK code lengths with the common modulation of Quadra-Phase-Shift-Key (QPSK) used since the 1970s.

Primary CSK Codes Advantages

The advantages of these two families of CSK random binary codes include:

- Common time synchronization independent of code length or chipping rate
- Common position tracking method independent of code length or chipping rate
- Common code generation process
- Transmission power spectral density profile controlled through selection of code pulse width distribution
- Common modulation of QPSK
- Common CSK memory storage and retrieval processes usable by all network code (symbol) user members
- Common universal time synchronized transmission 20-microsecond and 200 microsecond time slots
- Pre-filtered CSK random binary codes optimized for minimum across all possible symbol cross-correlations