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Joseph J. Rushanan* (jjr@mitre.org), The MITRE Corporation, 202 Burlington Road, Bedford, MA 01730. *Number Theory and a New GPS Signal.*

Global Positioning System (GPS) modernization involves creating new signals such as the L1C signal, which will provide users worldwide with superior performance while co-existing with both other GPS signals and international navigation systems. A core design component of L1C is the spread spectrum code family, which is a family of binary sequences that have good auto- and cross-correlation properties. For L1C, these sequences are length 10230, which precludes using well-established families. We focused on Weil codes, which are a relatively new family of binary sequences. Each Weil code is the shift-and-add of the prime length quadratic residue ("Legendre") sequence and one of its shifts. The Weil codes have correlation sidelobes bounded by twice the square root of the length, which is comparable to the better known sequence families. The bound is derived from Weil's Theorem on sums of quadratic residues of polynomials modulo a prime. The L1C codes were created by using length-10223 Weil codes and a fixed 7-bit pad. A search strategy was developed based on the dependence of correlation properties on the pad location. While describing this search, we indicate unsolved problems for Weil codes and discuss their practical relevance. (Received September 24, 2006)