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Caleb McKinley Shor* (cshor@wne.edu), Box H-5156, 1215 Wilbraham Rd, Springfield, MA 01119. *Codes over rings of square cardinality, lattices, theta functions, and specific examples.* Preliminary report.

Let $\ell > 0$ be a square-free integer congruent to 3 mod 4 and \mathcal{O}_K the ring of integers of the imaginary quadratic field $K = \mathbb{Q}(\sqrt{-\ell})$. Let p be a prime. If $p \nmid \ell$ then the ring $\mathcal{R} := \mathcal{O}_K/p\mathcal{O}_K$ is isomorphic to \mathbb{F}_{p^2} or $\mathbb{F}_p \times \mathbb{F}_p$. Let C be a code over \mathcal{R} . Given such a code, one can create a lattice $\Lambda_\ell(C)$ over K . One can then construct the corresponding theta function of such a lattice.

In 2005, working with $p = 2$, K. S. Chua found an example of two non-equivalent codes that have the same theta function for $\ell = 7$ and different theta functions for larger values of ℓ . In this talk, motivated by Chua's example, we will consider the situation for general primes p . In particular, we will see how to represent these theta functions in terms of some basic theta series and see connections between these theta functions and weight enumerator polynomials. We will then see recent results involving explicit examples of non-equivalent codes with the primes $p = 2, 3, 5$ that have the same theta function for certain values of ℓ . (Received January 16, 2012)