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*Unitary groups over  $p$ -adic integers - the ramified case*

When  $L$  is a quadratic extension of a  $p$ -adic number field  $K$ , the Galois automorphism of  $L$  acts nontrivially on the ring of integers  $\mathcal{O}_L$ . Composing with the transpose induces an involution  $*$  on  $M_n(\mathcal{O}_L)$ . The resulting unitary group  $U_n(\mathcal{O}_L) = \{X : X^{-1} = X^*\}$  satisfies the congruence subgroup property, which means any continuous finite-dimensional representation factors through a congruence subgroup. This reduces the study of representations of these groups to the study of representations of unitary groups over the finite local rings  $R = \mathcal{O}/\mathcal{P}^N$ . Of particular interest is the description of irreducible constituents of the Weil representation of  $U_n(R)$  in this situation. Previous work of Gow and Szechtman treated the case where  $p$  is odd and  $L/K$  is unramified. Recently we have calculated the orders of these unitary groups  $U_n(R)$  when  $p$  is odd and  $L/K$  is ramified. We have determined irreducible constituents of the Weil representation and calculated the degrees of these characters when the level  $N$  is even, using tools from character theory and hermitian geometry over local rings. This is joint work with Fernando Szechtman, James Cruikshank, and Rachael Quinlan.