Gold, Robert; **Madan, Manohar**
Galois representations of Iwasawa modules. (English) ⎜Zbl 0603.12003⎟
Acta Arith. 46, 243-255 (1985).

Let p be an odd prime. The composite of a finite extension of $\mathbb{Q}$ with the unique $\mathbb{Z}_p$-extension over $\mathbb{Q}$ is called a $\mathbb{Z}_p$-field. Let L/K be a finite Galois p-extension of $\mathbb{Z}_p$-fields of CM-type. Let $G = \mathrm{Gal}(L/K)$ and A_K^- (resp. A_L^-) be the minus part of the p-class group of K (resp. L). Assume $\mu(A_K^-) = 0$.

The authors determine the structure of A_L^- as a $\mathbb{Z}_p[G]$-module in the case G is cyclic of order p and in the case G is cyclic of order p^2; where in the latter case they use Reiner's classification of $\mathbb{Z}_p[G]$ indecomposables [*C. W. Curtis* and *I. Reiner*, Methods of representation theory, with applications to finite groups and orders. Vol. I (1981; Zbl 0469.20001), pp. 730–742]. When G is a cyclic p-group, the structure of the subgroup of elements of order dividing p in A_L^- as an $\mathbb{F}_p[G]$-module is also determined.

Moreover, using the result in the case where G is cyclic of order p, by induction they determine the p-representation of G on $\mathrm{GL}(V)$ for a finite Galois p-extension L/K of $\mathbb{Z}_p$-fields of CM-type, where $V = \mathrm{Hom}_{\mathbb{Z}_p}(A_L^-, \mathbb{Q}_p/\mathbb{Z}_p) \otimes_{\mathbb{Z}_p} \mathbb{Q}_p$; which gives an alternative unified proof of Theorems 4 and 5 by *K. Iwasawa* [Tôhoku Math. J., II. Ser. 33, 263–288 (1981; Zbl 0468.12004)]. While in that paper using this result Iwasawa gave a different proof of Kida's formula [*Y. Kida*, J. Number Theory 12, 519–528 (1980; Zbl 0455.12007)], the authors use this formula in the proof. [The second named author with *J. G. D'Mello* gave another proof of Kida's formula in Manuscr. Math. 41, 75–107 (1983; Zbl 0516.12012).]

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MSC:

11R23   Iwasawa theory
11R29   Class numbers, class groups, discriminants

Cited in **1** Review
Cited in **5** Documents

Keywords:

Galois representations; Iwasawa modules; $\mathbb{Z}_p$-extension; $\mathbb{Z}_p$-fields of CM-type; Kida's formula

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