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ON CERTAIN IWAHORI INVARIANTS IN THE UNRAMIFIED PRINCIPAL SERIES

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An affine Hecke algebra is additively the tensor product of a finite dimensional Hecke algebra with the coordinate ring Θ of a complex torus. In this paper we give explicit formulas for eigenvectors of Θ in unramified principal series representations of the reductive p-adic group G associated to $\mathscr{H}$. This leads to new information about intertwining operators, Jacquet modules and submodules of principal series representations.

Let G be a reductive p-adic group, τ an unramified character of a minimal parabolic subgroup P, and $I(\tau) = \operatorname{ind}_P^G \tau$ the induced principal series representation of G. The space $I(\tau)^B$ of vectors in $I(\tau)$ which are invariant under an Iwahori subgroup B affords a representation of the affine Hecke algebra $\mathscr{H}$ corresponding to G. It is known that taking B-invariants yields an equivalence of categories between (admissible G-modules generated by their B-invariants) and (finite dimensional $\mathscr{H}$ modules). Thus the representation theory of $I(\tau)$ is captured by the action of $\mathscr{H}$ on $I(\tau)^B$. The irreducible representations of $\mathscr{H}$ have been classified ([**K-L**] and [**G**]). However, the decomposition of $I(\tau)^B$ itself, though well studied (see the references), is not completely understood. The purpose of this paper is to describe certain functions in $I(\tau)^B$ which are important for finding the submodules of this representation explicitly. This investigation enables us to extend some results of Rodier [**R**] and Rogawski [**Ro**], and also yields a new proof of the irreducibility criterion for $I(\tau)$ due to Kato and Müller ([**Ka**], [**M**]).

Recall (cf. [**L**]) that as a vector space, $\mathscr{H}$ is the tensor product of two subalgebras

$$\mathscr{H} = \Theta \otimes \mathscr{H}_W,$$

where $\mathscr{H}_W$ is the Hecke algebra of the finite Weyl group W of G and Θ is isomorphic to the coordinate ring of a maximal torus T in the complex Lie group which is dual to G in the sense of Langlands. As a $\mathscr{H}_W$-module, $I(\tau)^B$ is always the regular representation of $\mathscr{H}_W$, so as τ varies, the change in the structure of $I(\tau)^B$ is seen in the action of