TOKYO J. MATH.
VOL. 1, No. 1, 1978

On Singularities of the Harish-Chandra Expansion of the Eisenstein Integral on Spin (4,1)

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Introduction.

Let G be the universal covering group of De Sitter group and $G=KAN$ be its Iwasawa decomposition. Let MAN be a minimal parabolic subgroup of G. We consider the Eisenstein integral for MAN which is defined as follows;

$$(1)\qquad E(s, v, x)=\int_K e^{(s-3/2)t(xk)}\tau_1(k(xk))v\tau_2(k^{-1})dk\ , \qquad \text{for}\quad s\in \boldsymbol{C},\ x\in G\ ,$$

where τ_i are irreducible unitary representations of K on V_i $(i=1, 2)$ and $v\in \mathscr{V}_M=\{v;$ a linear endomorphism of V_2 into V_1 with $\tau_1(m)v=v\tau_2(m)$ for all $m\in M\}$ (see, § 3, [3], [5], [15]). Then Eisenstein integral $E(s, v, a_t)$ has the series expansion on a Weyl chamber A^+, which is divided into two parts associated with the Weyl group W of the pair (G, A);

$$(2)\qquad E(s, v, a_t)=E(s, t)C_1(s)v+E(-s, t)C_W(s)v\ , \qquad \text{for}\quad t>0\ ,$$

where $E(s, t)=e^{(s-3/2)t}\sum_{k=0}^{\infty} A_k(s)e^{-kt}$. (See, Harish-Chandra [3].) The eigenvalues of Casimir operator on G is parametrized by (s, v) and the function $x\mapsto E(s, v, x)$ is an eigenfunction corresponding to (s, v). By the change of variable $y=e^{-t}$, the differential equation for $E(s, v, a_t)$ is transformed to an ordinary differential equation with a regular singular point at $y=0$. The formula (2) gives the series expansion of the solution $E(s, v, a_t)$ around the regular singular point $y=0$. As the classical theory of differential equations teaches us, the coefficients $A_k(s)$ $(k\in \boldsymbol{Z})$ satisfies a certain recurrence formula with respect to k and they are not well-defined for all $s\in \boldsymbol{C}$. So, the formula (2) is valid on a certain open dense connected subset $\mathscr{O}(\tau_1, \tau_2)$ of $\boldsymbol{C}$. But the function $s\mapsto E(s, t)$ can be extended to a meromorphic function on $\boldsymbol{C}$ with values in the space of all linear endomorphisms on $\mathscr{V}_M$ (see, § 3). In this paper, we shall say

Received March 4, 1978