Theorem : *Let V_l be pure of weight w, let $G_\nu \subset G_K$ be a decomposition group at ν.*

a) If $w \neq 0$, then the restriction map

$$H^1(G_K, \Lambda_l) \longrightarrow \prod_\nu H^1(G_\nu, \Lambda_l)$$

is injective.

b) If $w \neq -2$, then $H^2(G_K, A_l) \xrightarrow{\sim} \oplus_\nu H^2(G_\nu, A_l) \cong \oplus_{\nu \in S} H^2(G_\nu, A_l)$.

This follows from a vanishing theorem of Serre. Applications are Tate's theorem $H^2(G_K, \mathbb{Q}/\mathbb{Z}) = 0$ or Kato's Hasse principle for function fields over number fields.

We mentioned a conjecture on the vanishing of $H^2(G_S, A(r))$ for certain $r \in \mathbb{Z}$ (where G_S is the S-ramified quotient of G_K) and the vanishing of $H^2(G_\nu, l\text{-Div}H^i(\overline{X}, \mathbb{Q}_l/\mathbb{Z}_l(n)))$ unless possibly for $\frac{i}{2} + 1 \leq n \leq i + 1$ (for $\nu \not| l$, this conjecture is "classical").

Theorem : $H^2(G_\nu, l\text{-Div}H^i(\overline{X}, \mathbb{Q}_l/\mathbb{Z}_l(n))) = 0$ *unless possibly for $0 \leq n \leq i+1$, where we assume that X has a regular model over $\mathcal{O}_\nu$ (the ring of integers in K_ν) in the case $\nu \not| l$.*

E. Kani

Arithmetic intersection theory

Arakelov's intersection theory on an arithmetic surface is based on the philosophy that potential theory on a Riemann surface is the archimedean analogue of the Lichtenbaum-Shafarevich intersection theory for curves over valuation rings. This analogy can be made precise in the following sense.

1) Integration. Let K_ν be a non-archimedean complete valued field (wrt. $|\ |_\nu$), W a projective variety over K_ν, viewed as a rigid analytic variety, and let $B(V)$ denote the boolean algebra generated by all affinoid subdomains. We consider finitely additive set functions

$$\mu : B(V) \rightarrow \{0,1\} \subset \mathbb{R} \qquad (\text{"binary measures"})$$

Theorem 1 : *The map $\mu \rightarrow V_\mu(\cdot) = -\int \log|\cdot|\, d\mu$ defines a bijection between the set of binary, regular, non-degenerate measures and the set of real-valued valuations V on F (=function field of W) with $V|_K = \nu$ (= $-\log|\cdot|_\nu$).*

2) non-archimedean Green's functions. The analogy between Green's functions and intersection theory becomes precise when one considers affinoid spaces $X \subset C$ (=curve). The Green's function g, the harmonic measures h_i, and induction coefficients $\{a_{ij}\}$ piece together to yield the intersection pairing

Theorem 2 : *The Green's function g, the harmonic measures $\{h_i\}$, the $\{a_{ij}\}$ exist for every affinoid $X \subset C$ and are uniquely characterized by their properties.*