BULLETIN OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 80, Number 4, July 1974

SOME NEW RESULTS ON THE EICHLER COHOMOLOGY OF AUTOMORPHIC FORMS

BY MARVIN I. KNOPP

ABSTRACT. We here formulate and prove several new results concerning the Eichler cohomology of automorphic forms on finitely generated Fuchsian groups of the first kind and, in particular, on H-groups. The Eichler cohomology we introduce is connected with automorphic forms of arbitrary real degree (as opposed to *integral* degree), with a suitably chosen underlying space of functions analytic in the upper half-plane. We obtain structure theorems for the Eichler cohomology groups which are analogous to earlier results of Eichler and Gunning.

I. **Introduction.** 1. The purpose of this article is the proof of some new results concerning the Eichler cohomology connected with automorphic forms on finitely generated Fuchsian groups of the first kind (in particular, on H-groups). More specifically we introduce Eichler cohomology groups associated with automorphic forms of arbitrary real (that is, not necessarily integral) degree and, with a suitable underlying space of functions, we determine the structure of these groups. (See Theorems 1 and 2.)

For our present purposes it is sufficient to consider Fuchsian groups Γ acting on $\mathscr{H}$, the upper half-plane. That is, Γ is a discrete group of linear fractional transformations acting on $\mathscr{H}$. For convenience we normalize Γ so that an element V of Γ has the form $z\to(az+b)/(cz+d)$, with a, b, c, d real and $ad-bc=1$. We also identify V with the matrices $\pm\left(\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}\right)$. In particular we call Γ an *H-group* provided

(i) Γ is finitely generated,

(ii) Γ is discrete, but discontinuous at no point of the real line,

(iii) Γ contains translations.

In essence, then, an H-group is a finitely generated Fuchsian group of the first kind which has at least one parabolic class.

2. *Automorphic forms.* The automorphic forms to be considered here are of arbitrary real degree with multiplier system, meromorphic in $\mathscr{H}$, and meromorphic (in the appropriate uniformalizing variables)

An address delivered before the Chicago Meeting of the Society on March 26, 1971 by invitation of the Committee to Select Hour Speakers for Western Sectional Meetings; received by the editors October 25, 1973.

AMS (MOS) subject classifications (1970). Primary 30A58; Secondary 10D15, 20H10.

Key words and phrases. Automorphic form, H-group, Eichler cohomology group, automorphic integral.