CHAPTER D-II

# CHARACTERIZATION OF POSITIVE SEMIGROUPS ON W*-ALGEBRAS

Since the positive cone of a C*-algebra has non-empty interior many results of Chapter B-II can be applied verbatim to the characterization of the generator of positive semigroups on C*-algebras. On the other hand a concret and detailed representation of such generators has been found only in the uniformly continuous case (see Lindblad (1976)).

A third area of active research has been the following: Which maps on C*-algebras (in particular, which derivations) commuting with certain automorphism groups are automatically generators of strongly continuous positive semigroups. For more informations we refer to the survey article of Evans (1984).

## 1. POSITIVE SEMIGROUPS ON PROPERLY INFINITE W*-ALGEBRAS

The aim of this section is to show that strongly continuous semigroups of Schwarz maps on properly infinite W*-algebras are already uniformly continuous. In particular, our theorem is applicable to such semigroups on $B(H)$. It is worthwhile to remark, that the result of Lotz (1985) on the uniformly continuity of every strongly continuous semigroup on $L^\infty$ (see A-II, Sec.3) does not extend to arbitrary W*-algebras. For example, take $M = B(H)$ , $H$ infinite dimensional, and choose a projection $p \in M$ such that $Mp$ is topologically isomorphic to $H$ . Therefore $M = H \oplus M_o$ , where $M_o = \ker(x \to xp)$ . Next take a strongly, but not uniformly continuous, semigroup $\mathcal{S}$ on $H$ and consider the strongly continuous semigroup $\mathcal{S} \oplus \mathrm{Id}$ on $M$ .

For results from the classification theory of W*-algebras needed in our approach we refer to [Sakai (1971), 2.2] and [Takesaki (1979), V.1].