Nuclear semidirect product of commutative automorphic loops

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An automorphic loop is a loop with all inner mappings being automorphisms. A semidirect product of groups is, on one hand, a group G with two subgroups $H < G$ and $K \triangleleft G$ such that $KH = G$ and $K \cap H = 1$. On the other hand, it is a construction of a group G from two groups K and H and a homomorphism $\varphi : H \to \mathrm{Aut}(K)$.

Now consider Q, a commutative automorphic loop. If $H < Q$ and $K \triangleleft Q$ such that $KH = Q$ and $K \cap H = 1$, it is reasonable to speak about a semidirect product of commutative automorphic loops. However, to obtain a construction simple to describe, it is useful to assume two additional conditions: K and H are abelian groups, and $K \leqslant N_\mu(Q)$. In this case we speak about a nuclear semidirect product.

This situation can be described as a construction too, using some mapping $\varphi : H^2 \to \mathrm{Aut}(K)$, satisfying some conditions. We show several examples and we notice that one of the ways how to fulfill the conditions is using φ bilinear. This case is studied deeper and we describe how to obtain such mappings.