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Weil Representations of the groups $GL_\epsilon^*(2, A)$ and $SL_\epsilon^*(2, A)$

Let A be a unitary ring with an involution $*$. Then the groups $GL_\epsilon^*(2, A)$ and $SL_\epsilon^*(2, A)$ are a (tamely) non-commutative version of the general linear and special linear groups over a field, consisting of 2×2 matrices with coefficients in A, that satisfy certain commuting relations which involve $*$. Symplectic groups, orthogonal groups and also non-classical groups are examples of the groups under consideration for different choices of the involutive ring.

Several times these groups afford Bruhat-like presentations. This is the case when A is an artinian simple involutive ring, and when A admits a weak $*$-analogue of the euclidean algorithm for coprime elements. A very general Weil representation can be constructed in this case, from abstract core data, (recovering as particular cases, the Weil representations of the symplectic groups $Sp(2n, k)$ for k a finite field and the generalized Weil representation of a non-classical case of an involutive base ring having a nilpotent radical).

When a presentation is not at hand a different but also elementary approach to the construction of Weil representations, which is more geometric in nature, can be applied.