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Isocategorical Groups and their Weil Representations

Two groups are called isocategorical over a field k if their respective categories of k -linear representations are monoidally equivalent. We classify isocategorical groups over arbitrary fields, extending the earlier classification of Etingof-Gelaki and Davydov for algebraically closed fields. In order to construct concrete examples of isocategorical groups a new variant of the Weil representation associated to isocategorical groups is defined. We construct examples of non-isomorphic isocategorical groups over any field of characteristic different from two and rational Weil representations associated to symplectic spaces over finite fields of characteristic two.