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Reversible skew Laurent polynomial rings and deformations of Poisson automorphisms. (English) Zbl 1188.16022

J. Algebra Appl. 8, No. 5, 733-757 (2009).

The authors consider the skew Laurent polynomial ring $S = R[x^{\pm 1}; \alpha]$, where α is an automorphism of R, and study involutions θ on S such that $\theta(x) = x^{-1}$ and the restriction $\theta|_R$ is an involution γ of R. They show that such θ exists if and only if $\gamma\alpha\gamma^{-1} = \alpha^{-1}$, in which case they say that θ is a reversing automorphism and S is a reversible skew Laurent polynomial ring. The concept of reversibility arises in dynamical systems and the theory of flows.

The authors study invariants for reversing automorphisms and then apply their results to two principal examples: the localization at the powers of a normal element of the enveloping algebra of the two-dimensional non-Abelian Lie algebra and the coordinate ring of the quantum torus. Both these rings are deformations of Poisson algebras over the base field $\mathbb{F}$ and in each case the ring of θ-invariants is a deformation of the coordinate ring of a surface in $\mathbb{F}^3$ and is a factor of a deformation of $\mathbb{F}[x_1, x_2, x_3]$ for a Poisson bracket determined by the appropriate surface. Both deformations are examples of algebras determined by noncommutative potentials.

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MSC:

16S36	Ordinary and skew polynomial rings and semigroup rings
16W20	Automorphisms and endomorphisms
17B63	Poisson algebras
16S80	Deformations of associative rings
16W22	Actions of groups and semigroups; invariant theory (associative rings and algebras)
16W10	Rings with involution; Lie, Jordan and other nonassociative structures

Keywords:

skew Laurent polynomial rings; Poisson automorphisms; rings of invariants; deformations of Poisson algebras

Full Text: DOI arXiv

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