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On The Third-Degree Continuous Cohomology of Simple Lie Groups

We show that the collection of connected, simple Lie groups that have non-vanishing third-degree continuous cohomology with trivial $\mathbb{R}$-coefficients consists precisely of all simple complex Lie groups and of $\widetilde{\mathrm{SL}_2(\mathbb{R})}$.

Keywords: Continuous cohomology, simple Lie groups, complex structures, Lie algebra cohomology, van Est's theorem, cohomology of homogeneous spaces of simple Lie groups, Dynkin index.

MSC: 22E41, 22E46, 57T10, 57T15.