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Journal of Lie Theory 18 (2008) 961–978

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Proper Actions on Corank-One Reductive Homogeneous Spaces

Let \mathbf{k} be a local field, G the set of \mathbf{k} -points of a connected semisimple algebraic \mathbf{k} -group \mathbf{G} , and H the set of \mathbf{k} -points of a connected reductive algebraic \mathbf{k} -subgroup \mathbf{H} of \mathbf{G} such that $\text{rank}_{\mathbf{k}}(\mathbf{H}) = \text{rank}_{\mathbf{k}}(\mathbf{G}) - 1$. We consider discrete subgroups Γ of G acting properly discontinuously on G/H and we examine their images under a Cartan projection $\mu : G \rightarrow V^+$, where V^+ is a closed convex cone in a real finite-dimensional vector space. We show that if Γ is neither a torsion group nor a virtually cyclic group, then $\mu(\Gamma)$ is almost entirely contained in one connected component of $V^+ \setminus C_H$, where C_H denotes the convex hull of $\mu(H)$ in V^+ . As an application, we describe all torsion-free discrete subgroups of $G \times G$ acting properly discontinuously on G by left and right translation when $\text{rank}_{\mathbf{k}}(\mathbf{G}) = 1$.

Keywords: Discrete subgroups of Lie groups, discrete subgroups of p -adic groups, reductive groups over local fields, properly discontinuous action, Cartan decomposition.

MSC: 20G25, 22E40, 57S30