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Fuquan Fang* (fuquan_fang@yahoo.com), Notre Dame, IN 46545, **Karsten Grove**, Notre Dame, IN 46545, and **Gudlaugur Thorbergsson**. *Tits Geometry and Positive Curvature*.

There is a well known link between (maximal) irreducible polar representations and isotropy representations of irreducible symmetric spaces provided by Dadok. Moreover, the theory by Tits and Burns - Spatzier provides a link between irreducible symmetric spaces of non-compact type of rank at least three and compact topological spherical irreducible buildings of rank at least three.

We discover and exploit a rich structure of a (connected) chamber system of finite (Coxeter) type M associated with any polar action of cohomogeneity at least two on any simply connected (closed) positively curved manifold. Although this chamber system is typically not a (Tits) geometry of type M , we prove that in all cases but one that its universal (Tits) cover indeed is a building. We construct a topology on this universal cover making it into a compact topological building in the sense of Burns and Spatzier.

We use this structure to prove the following rigidity theorem:

Any polar action of cohomogeneity at least two on a simply connected positively curved manifold is smoothly equivalent to a polar action on a rank one symmetric space. (Received September 04, 2012)