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Journal of Lie Theory 24 (2014) 931–956

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Rook Placements in A_n and Combinatorics of B -Orbit Closures

Let G be a complex reductive group, B be a Borel subgroup in G , \mathfrak{n} be the Lie algebra of the unipotent radical of B , and \mathfrak{n}^* be its dual space. Let Φ be the root system of G , and let Φ^+ be the set of positive roots with respect to B . A subset of Φ^+ is called a rook placement if it consists of roots with pairwise non-positive inner products. To each rook placement D one can associate the coadjoint orbit Ω_D of B in \mathfrak{n}^* . By definition, Ω_D is the orbit of f_D , where f_D is the sum of root covectors corresponding to the roots from D . We find the dimension of Ω_D and construct a polarization of \mathfrak{n} at f_D . We also study the partial order on the set of rook placements induced by the incidences among the closures of orbits associated with rook placements.

Keywords: Coadjoint orbits, Borel subgroup, root systems, rook placements, polarizations.

MSC: 22E25, 17B22