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Classification of two Involutions on Compact Semisimple Lie Groups and Root Systems

Let \mathfrak{g} be a compact semisimple Lie algebra. Then we first classify pairs of involutions (σ, τ) of \mathfrak{g} with respect to the corresponding double coset decompositions $H \backslash G / L$. (Note that we don't assume $\sigma\tau = \tau\sigma$.) In a previous paper ["Double coset decompositions of reductive Lie groups arising from two involutions", J. Algebra 197 (1997) 49–91], we defined a maximal torus A , a (restricted) root system Σ and a "generalized" Weyl group J and then we proved

$$J \backslash A \cong H \backslash G / L$$

when G is connected. In this paper, we also compute Σ and J for some representatives of all the pairs of involutions when G is simply connected. By these data, we can compute Σ and J for "all" the pairs of involutions.