Model spaces as constrained Hamiltonian systems: Application to SU(2)

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Motivated by group-theoretical questions that arise in the context of asymptotic symmetries in gravity, we study model spaces and their quantization from the viewpoint of constrained Hamiltonian systems. More precisely, we propose that a central building block in the construction of the model space for a generic Lie group G is the symplectic submanifold of T^*G that one obtains when one imposes only the second-class constraints in the construction of the coadjoint orbit as a symplectic quotient. Before turning to the non-compact infinite-dimensional groups relevant in 3d gravity, we work out all details in the simplest case of SU(2). Besides recovering well-known results on the quantum theory of angular momentum from a unified perspective, the analysis sheds some light on the definition and properties of spin-weighted/monopole spherical harmonics, that are ubiquitous in celestial holography.