

# Algebraic and geometric properties of flag Bott-Samelson varieties and applications to representations

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The notion of flag Bott manifolds is introduced in [1] as a generalization of Bott manifold and flag variety. In this talk, we introduce the notion of flag Bott–Samelson variety as a generalization of Bott–Samelson variety and flag variety. Using a birational morphism from an appropriate Bott–Samelson variety to a flag Bott–Samelson variety, we compute Newton–Okounkov bodies of flag Bott–Samelson varieties as generalized string polytopes, which are applied to give polyhedral expressions for irreducible decompositions of tensor products of  $G$ -modules. Furthermore, we show that flag Bott–Samelson varieties are degenerated into flag Bott manifolds with higher rank torus actions which generalizes the toric degeneration result of Grossberg and Karshon of Bott-Samelson varieties to Bott manifolds. We also find the Duistermaat–Heckman measures of the moment map images of flag Bott–Samelson varieties with the torus action together with invariant closed 2-forms. This talk is based on the authors preprint [2].

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## References

- [1] S. Kuroki, E. Lee, J. Song and D. Suh, Flag Bott manifolds and the toric closure of a generic orbit associated to a generalized Bott manifolds, arXiv: 1708.02082 (2017)
- [2] N. Fujita, E. Lee and D. Suh Algebraic and geometric properties of flag Bott-Samelson varieties and applications to representations, *preprint* (2018)