The Stellar Kinematics of Spiral Galaxies with a Boxy/Peanut-Shaped Bulge

Aeree Chung, Martin Bureau (Columbia University)

We present the stellar disk kinematics of edge-on galaxies with a boxy/peanut-shaped (B/PS) bulge, the fraction of which is significant ($\approx 45\%$) among spirals. Recent studies of gaseous position-velocity diagrams for these objects showed that most B/PS bulges must be the edge-on projection of a thick bar. By investigating their stellar kinematics, we intend not only to confirm the relation between B/PS bulges and bars but also to extend these studies to gas-poor galaxies. Long-slit spectra around the Mgb feature were obtained along the major-axis of 30 galaxies, 24 with a B/PS bulge and 6 with more spheroidal bulges. The stellar line-of-sight velocity distributions were derived with the Fourier Correlation Quotient method and fitted with Gauss-Hermite polynomials, yielding mean stellar velocity (V), velocity dispersion (σ), as well as skewness (h_3) and kurtosis (h_4) radial profiles. The results were compared with the N-body simulations and kinematic bar diagnostics of Bureau & Athanassoula. We find kinematic bar signatures in 21/24 galaxies with a B/PS bulge and 3/6 control galaxies (including the two transition objects). These show characteristic double-hump rotation curves, dispersion profiles with secondary peaks and/or flat tops, and correlated h_3 and V over the presumed bar length. Our h_4 profiles generally have poor signal-to-noise ratios. h_3 and V are also anti-correlated in the very central regions of many galaxies, implying that they contain a fast rotating, quasi-axisymmetric, central stellar disk. The latter are not present in the simulations and were probably formed through gas inflow and subsequent star formation, not considered by the N-body simulations. Nevertheless, the kinematic bar signatures depend on the viewing angle as predicted by the simulations. The stellar kinematic profiles presented thus confirm that B/PS bulges are the edge-on projections of thick bars. h_3 also turns out to be a useful parameter to trace asymmetries in disk, especially triaxiality.