A predicted orbital ellipticity gradient in the disk of the Milky Way

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In (1) it was demonstrated that, in some galactic fields intermediate between the harmonic oscillator field and the keplerian field, it is possible, with a precisely tuned ellipticity profile, to create a large set of nested orbit streamlines, which all co-precess, largely eliminating the winding problem.
It was shown that for fields within this range, the required ellipticity profile will have orbital ellipticity decreasing with increasing orbit size.

It seems likely that the disk of the milky way may be a galactic component of this type, in which the co-precession of the orbit streamlines results from a precisely tuned ellipticity profile. This leads directly to the following predictions about the orbit streamlines of the main part of the milky way disk (the orbit streamlines which contribute to the spiral density waves of small pitch angle and large azimuthal extent).

It is predicted that in the main part of the disk of the milky way:
(a) The orbit streamlines all have the same apsidal precession rate.
(b) The orbit streamlines have orbital ellipticity decreasing with increasing orbit size, i.e. the orbits become more circular with increasing orbit size.

(It is interesting that an ellipticity gradient, with the orbits becoming more circular with increasing orbit size, was indicated for some of the gas orbit streamlines of the milky way disk, in (2) and in (3)).

References

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