Spiral Galaxies When Disks Dominate their Halos (using Arm Pitches and Rotation Curves)

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GOAL **Using observation and dynamical theory we show that some spiral galaxies are disk dominated rather than halo dominated over their density wave arm regions (even with flat rotation curves).**

DISK SURFACE DENSITY

$$\mu_{D,V} = 2\left(\frac{V^2}{\pi G}\right)\left(\frac{\tan i_m}{mr}\right)\left[1+\frac{m\left(1-r/r_{CR}\right)}{\sqrt{2}}\right].$$

PURE HALO MASS ILR to OLR.

$$M_{100\%,H} = \left(\frac{V^2}{G}\right)\left(r_{OLR} - r_{ILR}\right).$$

MASS RATIO

Integrated disk surface density mass ILR to OLR = M_D.
F_D = Mass ratio of M_D actual disk to $M_{100\%\,H}$ ILR to OLR.

$$F_D = 4\tan i / m.$$

Actual Halo = 1- F_D ILR to OLR

VARIABLES

μ_D	= disk surface mass density
$\Omega = V/r$	= flat V orbital angular rate
r_{CR}	= co-rotation radius
$\Omega_p = V/r_{CR\ nn}$	= angular rate pattern speed
m	= multiplicity of arms
a	= velocity dispersion for arm stability
r_{ILR}	= inner Lindblad resonance radius
$_{OLR}$	= outer Lindblad resonance radius

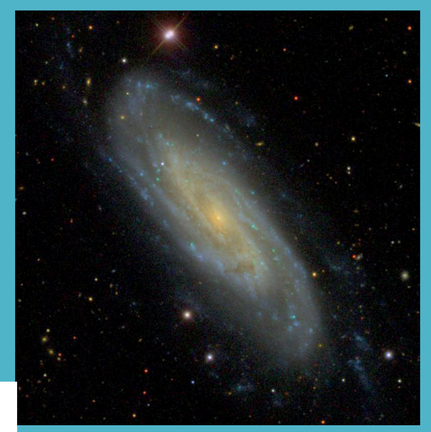
i = pitch angle of spiral arm
r = radius ILR to OLR

		Disk Dominance, F_D
NGC 7217, tightly wound ,	i = 4.8°	0.13
M100,	i = 18°	0.63
M51,	i = 15°	0.54
M101,	i = 20°	0.73
NGC 3198, loosely wound	i = 30°	0.86

Increasing disk significance

EXAMPLES

NGC 7217, Halo Dominated



NGC3198, Disk Dominated

For more details see link,
[(4) (PDF) Spiral Galaxies When Disks Dominate their Halos (using Arm Pitches and Rotation Curves) (researchgate.net)]