

Figure 1. Plan view of the Milky Way showing the locations of high-mass star forming regions (HMSFRs) with trigonometric parallaxes measured by the VLBA, VERA, and the EVN. The Galactic center (red asterisk) is at (0,0) and the Sun (red Sun symbol) is at (0,8.34). HMSFRs were assigned to spiral arms based primarily on association with structure seen in ℓ - V plots of CO and H I emission (and not based on the measured parallaxes): inner Galaxy sources, yellow dots; Scutum arm, cyan octagons; Sagittarius arm, magenta hexagons; Local arm, blue pentagons; Perseus arm, black squares; Outer arm, red triangles. Open circles indicate sources for which arm assignment was unclear. Distance error bars are indicated, but many are smaller than the symbols. The background gray disks provide scale, with radii corresponding in round numbers to the Galactic bar region (≈ 4 kpc), the solar circle (≈ 8 kpc), co-rotation of the spiral pattern and Galactic orbits (≈ 12 kpc), and the end of major star formation (≈ 16 kpc). The short COBE “boxy-bar” and the “long” bar (Blitz & Spergel 1991; Hammersley et al. 2000; Benjamin 2008) are indicated with shaded ellipses. The solid curved lines trace the centers (and dotted lines the 1σ widths) of the spiral arms from the log-periodic spiral fitting (see Section 3 and Table 2). For this view of the Milky Way from the north Galactic pole, Galactic rotation is clockwise.

(A color version of this figure is available in the online journal.)

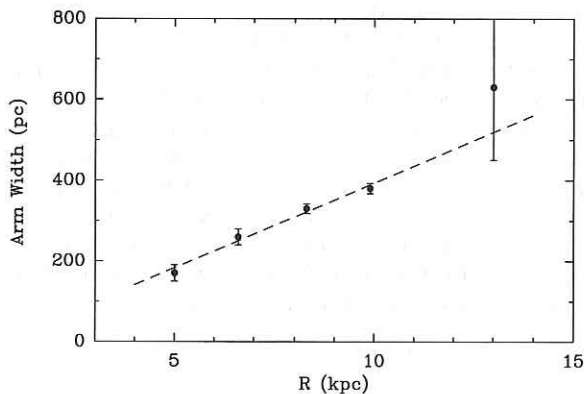


Figure 2. Spiral arm width increasing with Galactocentric radius. The dashed line is a variance-weighted fit with a slope of 42 pc kpc^{-1} . See Table 2 for details.

Spiral pitch angles vary between 7° and 20° as listed in Table 2. The significant range of pitch angles among arms suggests that no single value applies to all arms and, possibly, cannot be applied to the full length of an arm as it winds around the Galaxy (Savchenko & Reshetnikov 2013). However, these pitch angles are characteristic of spiral galaxies of Sb to Sc class (Kennicutt 1981), further supporting the identification of ℓ - V tracks as spiral arms for the Milky Way.

The HMSFRs with measured parallaxes are clearly tracing the major spiral arms of the Milky Way (see Figure 1), and details of the locations and properties of the individual arms can be found in the primary references (Hachisuka et al. 2014; Choi et al. 2014; Zhang et al. 2013; Xu et al. 2013; Wu et al. 2014; Sato et al. 2014; Sanna et al. 2014). Interestingly, some surprising results are already evident. We are finding that the Perseus arm, thought to be one of the major spiral arms of the