The AMIGA sample of isolated galaxies: VIII. The rate of asymmetric HI profiles in spiral galaxies

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(abridged) Measures of the HI properties of a galaxy are among the most sensitive interaction diagnostic at our disposal. We report here on a study of HI profile asymmetries (e.g., lopsidedness) in a sample of some of the most isolated galaxies in the local Universe. This presents us with an excellent opportunity to quantify the range of intrinsic HI asymmetries and provides us with a zero-point calibration for evaluating these measurements in less isolated samples. We characterize the HI profile asymmetries and search for correlations between HI asymmetry and their environments, as well as their optical and far infrared (FIR) properties. We use high signal-to-noise global HI profiles for galaxies in the AMIGA project (this http URL). We restrict our study to N=166 galaxies with accurate measures of the HI shape properties. We quantify asymmetries using a flux ratio parameter. The asymmetry parameter distribution of our isolated sample is well described by a Gaussian model. The width of the distribution is sigma=0.13, and could be even smaller (sigma=0.11) if instrumental errors are reduced. Only 2% of our carefully vetted isolated galaxies sample show an asymmetry in excess of 3sigma. By using this sample we minimize environmental effects as confirmed by the lack of correlation between HI asymmetry and tidal force (one-on-one interactions) and neighbor galaxy number density. On the other hand, field galaxy samples show wider distributions and deviate from a Gaussian curve. As a result we find higher asymmetry rates (~10-20%) in such samples. We find evidence that the spiral arm strength is inversely correlated with the HI asymmetry. We also find an excess of FIR luminous galaxies with larger HI asymmetries that may be spirals associated with hidden accretion events. Our sample presents the smallest fraction of asymmetric HI profiles compared with any other yet studied.

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