Atomic Hydrogen-Bearing Ultra-Diffuse Galaxies: A Look Into AGC 749290

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Recommended Citation
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What is an ultra-diffuse galaxy?
- A galaxy that has very few stars for its given radius (low surface brightness).
- Appears very dim in optical images.

Our Question: Why are UDGs so diffuse?
- Are there other characteristics of the galaxy that could explain its diffuseness?
- Could the galaxy’s motions explain its diffuseness?

What is HI gas and how do we observe it?
- HI gas is atomic hydrogen that emits at a wavelength of 21 cm.
- HI gas is observed by radio telescopes in order to study the gas content of the galaxy (blue ellipse).

How do we process radio data?
- Remove interference in CASA.
- Create radio images.
- Fit spectrum and compare.

How are AGC 749290’s Characteristics?
- The stars in an ultra-diffuse galaxy are too spread out, making the galaxy appear very dim.
- AGC 749290 is an ultra-diffuse galaxy, but has a defined disk of atomic hydrogen (HI) gas.
- The gas is misaligned from the stars.
- The galaxy is rotating but at a slower rate than expected.

What is HI gas and how do we observe it?
- Can observe gas in the galaxy in radio wavelengths.
- HI gas is atomic hydrogen that emits at a wavelength of 21 cm.
- Very Large Array (VLA) is an array of radio telescopes that allows for higher resolution radio images to be taken.
- Worked on data from one UDG, AGC 749290 in two different resolutions.

The telescopes in the VLA can be moved along a track to different configurations which give different resolutions. The distance between the most separated telescopes determines the overall resolution of the image taken.

How is AGC 749290 moving?
- When a source is moving away from an observer, the waves become elongated, making them appear redder than they actually are (redshift).
- Variations in redshift can be observed for a single galaxy and are indicative of rotation.

Future Work
- Further compare this galaxy to typical sources based on different properties such as color, dark matter content, and gas mass ratios.
- Analyze other HI-bearing UDGs in similar ways to better understand why and how these galaxies behave.

Main Points
- The stars in an ultra-diffuse galaxy are too spread out, making the galaxy appear very dim.
- AGC 749290 is an ultra-diffuse galaxy, but has a defined disk of atomic hydrogen (HI) gas.
- The gas is misaligned from the stars.
- The galaxy is rotating but at a slower rate than expected.

How is AGC 749290 moving?
- Clear gradient shows the rotation of the gas.
- Darker colors are moving toward us and lighter are moving away.

Future Work
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